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0.30 AN IMPROVED METHOD FOR THE LIQUID SCINTILLATION COUNTING OF $^{14}CO_2$

Lin, Tz-Hong, and Helmut Pohlit (Laboratory of Chemical Biodynamics, Lawrence Radiation Laboratory, University of California, Berkeley 94720)
Analytical Biochemistry 28, Nos. 1-3, 150-155 (April 4, 1969)

The task of determining the specific activity of $^{14}CO_2$ samples is unique because $^{14}CO_2$ is a gas and because it has a key role in many degradative determinations of the ^{14}C distribution in organic compounds. $^{14}CO_2$ can be counted in three ways: (1) in the gas phase, for example, with proportional tubes, (2) in the solid state, for example, as $Ba^{14}CO_3$, and (3) in the dissolved state, using aqueous carbonate to "bind" the CO_2 into the liquid scintillation solutions. However, all these methods have certain disadvantages. The authors experimented with methods to selectively convert CO_2 to nonvolatile compounds whose weight and purity can be easily determined, and which compounds are soluble in standard scintillation solution. They used the Grignard reaction of CO_2 with phenylmagnesium bromide in ether to obtain benzoic acid, which can be purified by sublimation and by gas-liquid chromatography of its methyl esters. Both of these compounds are sufficiently nonvolatile to be determined by weighing. Also, they are soluble in the "toluene" scintillation solution and have little quenching effect. The accuracy of the method is limited only by the accuracy of the liquid scintillation counter (1.5 percent). It has been applied with particular success in connection with

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 Abstracter: F. T. Piskur

0.322 REDUCTION OF SELENOCYSTINE BY CYSTEINE OR GLUTATHIONE

Dickson, R. C., and A. L. Tappel (Department of Food Science and Technology, University of California, Davis 95616)
Archives of Biochemistry and Biophysics 130, Nos. 1-2, 547-550 (March 1969)

Over the past 5 years, investigators have reported that diselenides can be reduced to selenols with sodium borohydride and with hypophosphorous acid; that they usually cannot be reduced by thiols; and that they can be reduced by dithiothreitol. The present authors investigated the extent to which two sulfhydryl compounds, cysteine and glutathione, could reduce selenocystine at pH 7.

Nitrogen-saturated solutions of selenocystine (CySeSeCy), cysteine (CySH), glutathione (GSH), and CySeSeCy mixed with various concentrations of sulfhydryl compounds were prepared in phosphate buffer at pH 7 and ionic strength 0.2. Their ultraviolet spectra were monitored from 380 to 210 mμ at 25° C. and recorded. The equilibrium constant (K_1) for selenocystine reduction was calculated for 10^{-4} M CySeSeCy with various concentrations of XSH (cysteine or glutathione) added. The difference between absorbance at 248 mμ of XSH and of XSH + 10^{-4} M CySeSeCy was assumed to be a measure of the amount of ionized selenocysteine ($CySe^-$) produced; the absorbance of CySeSeCy alone was negligible.

Adding XSH to the CySeSeCy produced a change in the ultraviolet spectrum within 2-5 sec. The new peak (at 248 mμ) did not increase with time; rather, it slowly disappeared in 20-60 min. on exposure of the solution to atmospheric

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 Abstracter: L. Baldwin

0.35 ATP DEPENDENT CONFORMATIONAL CHANGE IN "SPIN LABELLED" SARCOPLASMIC RETICULUM

Landgraf, William C. (Analytical Instrument Division, Varian Associates, Palo Alto, California 94303), and Giuseppe Inesi (Cardiovascular Research Institute, University of California Ed. Center, San Francisco, California 94122; and Department of Physiology, University of the Pacific, San Francisco 94155)
Archives of Biochemistry and Biophysics 130, Nos. 1-2, 111-118 (March 1969)

Ebashi and Lipman (1962) and Hasselbach and Makinose (1962) reported that sarcoplasmic reticulum (SR), isolated in the form of vesicular fragments, is able to accumulate Ca^{++} at a very rapid rate. This property of SR has important physiologic implications, inasmuch as the process controls the state of contraction and relaxation in muscle by regulating the intracellular concentration of calcium ions (Weber et al.,1963). Isolated membrane vesicles in the presence of ATP (adenosine 5'-triphosphate) develop a high affinity for Ca^{++}, and the subsequent uptake is accompanied by ATP hydrolysis. Although there is information on the kinetics and energy requirement for Ca^{++} uptake, nothing is known of the conformational changes that accompany the process. In the experiments reported in this paper, the authors used spin labeling to explore the possibility of conformational change in the membrane during the uptake of Ca^{++}.

Good spin labeling of membrane vesicles was obtained by reacting fragmented SR with nitroxide iodoacetamide. The EPR (electron paramagnetic resonance)

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 Abstracter: F. T. Piskur

0.38 NATURE AND MECHANISMS OF OXYGENASES

Hayaishi, Osamu, and Mitsuhiro Nozaki (Department of Medical Chemistry, Kyoto University, Faculty of Medicine, Kyoto, Japan)
Science 164, No. 3878, 389-396 (April 25, 1969)

This paper is a review of information on enzymes (oxygenases) involved in the biological fixation of molecular oxygen. The oxygenases bring about the direct interaction of gaseous oxygen with organic molecules and participate in numerous metabolic transformations by catalyzing degradative and biosynthetic processes in animals, plants, and microorganisms. The enzymes are also involved in the metabolic disposal of certain drugs and foreign material. Current studies on the mechanism of oxygenase action are focused on two aspects--the nature of "active oxygen" and the means by which it is formed. Apparently in dioxygenase reactions, iron is involved, and iron-bound oxygen is in the activated form. In monooxygenase reactions, molecular oxygen, organic substrate, and reducing agent, either internal or external, form a ternary complex. The oxygenation of organic substrate and the reduction of one oxygen atom to water seem to occur at the same time. Even so, certain evidence seems to indicate that in monooxygenase reactions, molecular oxygen is activated by the reducing agent to O_2^- or to O_2^{--} or their equivalent. Iron or copper may be involved in some monoxygenase reactions but not in others. [8 figures, 3 tables, 60 references]

 Abstracter: F. T. Piskur

0.322

oxygen. The ultraviolet spectrum of cystine did not change with addition of XSH. Because 10^{-4} M CySeSeCy completely reduced with an excess of dithiothreitol or sodium borohydride gave a peak identical in position and equivalent in height to that reported for a similar concentration of $CySe^-$, the authors conclude that XSH rapidly reduces CySeSeCy to $CySe^-$. The variation in absorbance of $CySe^-$ at 248 mμ was a function of the concentration of XSH added. An inflection in the curve that illustrates this variation occurs at one-half total absorbance--that is, at one-half total reduction. This curve, along with the values for K_1, indicates that XSH can completely reduce CySeSeCy or CySeSX to $CySe^- + H^+$ when present in concentrations about 10^3 times greater than the concentration of the selenium-containing compounds.

Most normal tissues contain GSH at a concentration of about 10^{-3} or 10^{-2} M and Se at about 10^{-6} M. Therefore, any residues of CySeSeCy or of sulfoselenocystine that are present in the free state or in normal proteins are probably in the reduced, or selenol, state, as are any small amounts of selenoglutathione or selenocoenzyme A. Since $CySe^-$ compounds are known to catalyze the sulhydryldisulfide exchange activation of sulfhydryl enzymes by rapid proton transfer, the authors postulate that one of the biochemical functions of Se in biological systems is the catalysis of critical sulfhydryl-disulfide exchange reactions. These reactions include activation and protection of sulfhydryl enzymes, formation of the disulfide bonds that are part of the tertiary structure of proteins, and, possibly, electron transport in proteins. The ratio of GSH to CySeSeCy in tissues may be critical--a low ratio may be reflected by a state of selenium toxicity, a high ratio by selenium deficiency. As proton transfer agents, the $-Se^-$ compounds may contribute to repair of free-radical damage sites in proteins; CySeSeCy and mixtures of CySeSeCy + XSH are known to decrease the free-radical damage to amino acids and enzymes caused by ionizing radiation. [3 figures, 1 table, 11 references]

0.38 (Cross Reference: 0.39)

ELECTRON-SPIN-RESONANCE EVIDENCE
FOR ENZYMIC REDUCTION OF OXYGEN TO A FREE RADICAL,
THE SUPEROXIDE ION

Knowles, P. F., J. F. Gibson, F. M. Pick, and R. C. Bray (Chester Beatty Research Institute, Institute of Cancer Research: Royal Cancer Hospital, London, S.W.3; and Department of Chemistry, Imperial College, London, S.W.7, England)
Biochemical Journal 111, No. 1, 53-58 (January 1969)

Enzyme reduction of molecular oxygen to hydrogen peroxide may occur as two single-electron steps or as one two-electron step. Although indirect evidence indicates that the two-step (single-electron) mechanism operates in certain enzyme reactions (Mason, 1965), formation of the oxygen radical has not been demonstrated unequivocally. Using the electron-spin-resonance (ERS) technique, the present authors give evidence that an ERS signal observed at pH 10 during the oxidation of substrates of oxygen catalyzed by xanthine oxidase is due to O_2^-, the superoxide free radical ion, stabilized by the alkaline medium, but not interacting with the enzyme molecule. The enzymically produced radical ion is identical with one obtained by oxidation of hydrogen peroxide by periodate. The authors compare the ERS parameters of the signals with values in the literature for O_2^- and discuss the stability of the ion.
[4 figures, 1 table, 24 references] [Abstracter: F. T. Piskur]

0.30 (Cross Reference: 7.50)

the Schmidt degradation of samples as small as 0.2 mmole where contamination of the CO_2 evolved is serious due to the necessarily large excess of reactants.
[1 figure, 1 table, 8 references]

0.35

spectra of the iodoacetamide labeled SR showed two distinct components, one weakly immobilized and one tightly immobilized. The two components of the spectra apparently correspond to two types of SH-groups. The denaturing agent guanidine produced a marked alteration of the EPR spectra of labeled SR. Solubilization of the membrane with deoxycholate also changed the EPR spectra, indicating that deoxycholate allows the breakdown of the sarcoplasmic membrane to smaller units and causes marked conformational changes.

Addition of ATP to nitroxide-iodoacetamide-labeled SR produced a slowly reversible change in the EPR spectra. Presence of Mg^{++} and Ca^{++} did not affect the appearance of such a change, but caused a more rapid reversal. Adenosine 5'-diphosphate, inosine 5'-triphosphate, and increasing the pH of the membrane suspension above 9.1 also modified the EPR spectra of labeled SR, causing an effect similar to that effect produced by ATP. The authors conclude that the effect of ATP suggests a conformational change due to simple binding of ATP to the membrane.
[5 figures, 1 table, 13 references]

0.32 (Cross Reference: 0.34)

SYNTHESES OF DL-GIGARTININE AND CONGRINE

Ito, Keiji (Faculty of Fisheries and Animal Husbandry, The University of Hiroshima, Fukuyama, Hiroshima, Japan), and Yoshiro Hashimoto (Laboratory of Marine Biochemistry, Faculty of Agriculture, The University of Tokyo, Japan)
Agricultural and Biological Chemistry 33, No. 2, 237-241 (February 1969)

Gigartinine and gongrine, isolated from the red alga Gymnogongrus flabelliformis, were confirmed by syntheses to be L-α-amino-δ-(guanylureido)-n-valeric acid and γ-(guanylureido)butyric acid, respectively.
[2 figures, 9 references] [Abstracter: F. T. Piskur]

0.38 THE REACTIVITY OF THE SULFHYDRYL GROUPS OF LOBSTER MUSCLE GLYCERALDEHYDE 3-PHOSPHATE DEHYDROGENASE

Wassarman, Paul M., and Jean P. Major (Medical Research Council Laboratory of Molecular Biology, Cambridge, England)
Biochemistry 8, No. 3, 1076-1082 (March 1969)

That glyceraldehyde 3-phosphate dehydrogenase is an authentic sulfhydryl enzyme has been well established. Moreover, it has the rare attribute among the dehydrogenases of crystallizing with its coenzyme (NAD^+) bound to the protein. Thus a great deal of interest in this enzyme has centered on the interactions that may occur between its SH groups and the NAD^+. To obtain information about the interrelation between the enzyme's structure and its function, the authors studied the glyceraldehyde 3-phosphate dehydrogenase from lobster muscle. The enzyme from lobster muscle was used because Davidson et al. (1967) had already thrown light on its complete primary structure and because it crystallizes in a form that is amenable to analysis by X-ray crystallography.

Based on titrations of native and modified forms of the enzyme in 8 M urea with 5,5′-dithiobis(2-nitrobenzoic acid), the authors were able to estimate that the crystalline glyceraldehyde 3-phosphate dehydrogenase from the lobster muscle contained 19.5±0.5 cysteine residues per 140,000 g. of enzyme. Under nondenaturing conditions, in the presence of a fortyfold molar excess of 5,5′-dithiobis(2-nitrobenzoic acid), all the SH groups reacted within about 15 min.; 4.5±0.5 of

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 Abstracter: L. Baldwin

0.5 ANTAGONISTIC EFFECT OF FATTY ACIDS AGAINST SALMONELLA IN MEAT AND BONE MEAL

Khan, Mahmood, and Michael Katamay (Darling and Company, Chicago, Illinois 60609)
Applied Microbiology 17, No. 3, 402-404 (March 1969)

Because Salmonella organisms are widely distributed in nature and may be transmitted via man, animals, and birds, animal byproduct meals may become recontaminated after manufacture and could, in turn, contaminate mixed feeds. Moyle (1966) hypothesized that there may be a Salmonella antagonist, possibly free fatty acids, in partially decomposed fatty tissues. The present study was designed to determine whether fatty acids have an antagonistic effect on the growth and viability of Salmonella organisms. Thirty-two different lipid materials were tested that contained a wide range of short- and long-chain free fatty acids. The effectiveness of the fatty acids was examined for their ability to repress growth of Salmonella in a solvent-extracted commercial meat and bone meal. A filter paper disk method (sensitivity) and a pour plate method were used to measure the inhibitory effect of fatty acids against Salmonella on Brilliant Green agar.

Fatty materials of relatively high molecular weight, including triglycerides and free fatty acids containing nine or more carbon atoms, inhibited growth of Salmonella when evaluated by the sensitivity and pour plate methods. The same materials when added to meat and bone meal inoculated with Salmonella, lowered the initial bacterial count immediately and no further change in count occurred

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 Abstracter: F. T. Piskur

0.5 (Cross Ref.: 8.8) INCIDENCE STUDY OF SPORES OF CLOSTRIDIUM BOTULINUM IN CONVENIENCE FOODS

Insalata, N. F., S. J. Witzeman, G. J. Fredericks, and F. C. A. Sunga (General Foods Corporation, Post Division Research, Battle Creek, Michigan 49016)
Applied Microbiology 17, No. 4, 542-544 (April 1969)

The purpose of this study was to gather data on the incidence of Clostridium botulinum spores in selected convenience food products. Four types of commercially available convenience foods were tested: (1) boil-in-the-bag (vegetables, fish, and poultry), (2) vacuum-packed foods (meat, cheese, and poultry), (3) pressurized foods (cake decorators, synthetic whipped cream, salad dressing, and cheese spread), and (4) dehydrated foods (fish, meat, poultry, cheese, and vegetables). The fish food products examined were lobster newburg, shrimp newburg, crab newburg, freeze-dried shrimp, freeze-dried king crab, shrimp salad mix, crab salad mix, and tuna salad mix. Four hundred samples were tested. Only one--a vacuum-packed frankfurter item--contained spores of Cl. botulinum (identified as Type B). [2 tables, 17 references]

 Abstracter: F. T. Piskur

0.6 PROTEINS FROM POLLUTANTS--MAKING DOLLARS OUT OF DROSS

Anonymous
Chemical Engineering 76, No. 8, 56, 58 (April 21, 1969)

The impetus behind the parade of recent processes to upgrade liquid and solid wastes is the need to find dollar incentives for prevention of pollution. Leading the parade are the processes that use yeast, bacteria, and even laser beams to convert pollutants into edible products. This article gives examples of these three types of process, briefly explaining how they work and where they are being used.

A Swedish sugar company has announced plans to treat potato-starch waste with a symbiotic combination of endomicopsis and candida yeasts to make animal feed. The first yeast produces an enzyme that splits the starches into low-molecular-weight carbohydrates; the second yeast grows on these carbohydrates. The animal feed that results is 50 percent protein. The planned facility will cost about $1,000,000 to build and $200,000 a year to run, but the sale of yeast will make it almost self supporting. If the quality of the yeast can be upgraded enough to make it suitable for human consumption, the returns will be even more appreciable.

Three years ago an Ontario starch company, implementing a program developed by the University of Toronto and Chemical Engineering Research Consultants Ltd., began to make yeast from the wastes generated by shell-corn processing. Instead of pretreating the waste to prevent interference from undesired yeast strains,

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 Abstracter: L. Baldwin

0.5 (Cross Reference: 0.6)

INTERACTION OF SALT, pH, AND TEMPERATURE
ON THE GROWTH AND SURVIVAL OF SALMONELLAE IN GROUND PORK

Alford, John A., and Samuel A. Palumbo (Eastern Utilization Research and Development Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland 20705)
Applied Microbiology 17, No. 4, 528-532 (April 1969)

The purpose of this study was to determine the effect of the interaction of temperature, pH, and salt (NaCl) on the growth and survival of several strains of salmonellae in broth and in ground pork. Twenty-three strains of salmonellae grew in broth at 30° C. over a wide range of pH-NaCl combinations, but the same strains grew at 10° C. in broth limited to a few combinations of pH-NaCl. Those cultures that would not grow at 10° C. (because of the pH-NaCl effect) survived for long periods. Those cultures that would not grow at 30° C., however, remained viable for only a short time.

Salmonellae did not grow in ground pork stored at 4° C. but did grow in ground pork containing 3.5 percent NaCl stored at 10° C. In the ground pork, the salmonellae grew competitively with the natural flora at 10° C. even when the salmonellae constituted less than 5 percent of the initial flora, but the background flora grew at lower temperature than the salmonellae. Therefore, decreasing the holding temperatures of broth or ground pork inoculated with salmonellae increases the inhibitory effects on the organisms of pH and NaCl; however, decreasing temperatures decrease the lethal effects.
[2 figures, 2 tables, 16 references] [Abstracter: F. T. Piskur]

0.6 (Cross Reference: 9.19)

as is customary, the company adjusts the pH to favor the growth of the desired yeast. The resulting product is usually blended with existing glutens to give a high-protein animal feed--and the effluent from the 12,000-bushel-a-day corn-processing operation no longer creates pollution.

The Chemical Engineering Department at Louisiana State University expects to have a process operating by mid-1969 that can use almost any kind of waste as a base material--grass, bagasse, leaves, corn cobs, rice hulls, wheat straw, sawdust, excelsior, newspapers, books, rags, or wood. The waste is ground, treated with a mild alkali, oxidized for 5-10 min. at 240° F., and then fermented with cellulomonas. The enzymes produced by this mesophylic, cellulolytic, gram-negative rod bacterium hydrolyze the cellulose into simple sugars, which are thickened in mixer-settlers and then drum dried. On the basis of 1 lb. food/1 lb. feed, the 50-percent-protein food resulting is produced almost 3,000 times as efficiently as it could be produced by a cow. LSU expects the process will eventually produce 50-percent protein at a cost of 7¢/pound.

Other wastes being put to use include cottonseed hulls (hexane is used in a liquid-cyclone process to remove the gossypol and leave a bland, highly nutritious flour) and the spent cake remaining after oil is extracted from soybeans (a multipurpose food having the nutritional equivalent of a meal containing a glass of milk, a baked potato, a dish of green peas, and 4 oz. of beef is produced.) Oregon State University has announced a combined laser/microbial process that upgrades pulpmill lignin--the laser beam splits the tough lignins, leaving fragments that are susceptible to microbial attack. At the University of British Columbia, a project has been funded to convert the major part of waste sulfite liquors into propionic acid, acetic acid, and vitamin B_{12}. The process is expected not only to pay for itself but to provide a good return on investment.
[1 photograph]

0.38 (Cross Reference: 8.59)

these groups--that is, 1 SH group per polypeptide chain--reacted immediately. Disulfide formation at the four exceedingly reactive SH groups resulted in complete inactivation of the enzyme. Carboxymethylation of the "active site" cysteine residues reduced the number of SH groups that were reactive toward 5,5′-dithiobis (2-nitrobenzoic acid) to 4.5±0.5; about 12 of the SH groups were completely unreactive. When the enzyme was treated with iodosobenzoic acid, resulting in the formation of an intramolecular disulfide bond at the "active center," 11.0±0.5 SH groups reacted with 5,5′-dithiobis(2-nitrobenzoic acid).

The authors discuss the steps that lead to the unmasking of all the SH groups of the glyceraldehyde 3-phosphate dehydrogenase of lobster muscle upon reaction with 5,5′-dithiobis(2-nitrobenzoic acid).
[6 figures, 1 table, 41 references]

0.34 OCTOPAMINE: NORMAL OCCURRENCE IN SYMPATHETIC NERVES OF RATS

Molinoff, Perry, and Julius Axelrod (Laboratory of Clinical Science, National Institute of Mental Health, Bethesda, Maryland 20014)
Science 164, No. 3878, 428-429 (April 25, 1969)

The authors identified octopamine in organs (adrenal gland, brain, heart, salivary gland, spleen, and vas deferens) of normal rats by means of a sensitive enzymatic assay. It is localized in the sympathetic nerve endings. The physiological significance of octopamine is yet unclear.
[1 figure, 1 table, 10 references] [Abstracter: F. T. Piskur]

0.5 (Cross Reference: 4.82)

after the treated samples were incubated for 1 week at 37° C. Free fatty acids of low molecular weight (butyric, valeric, and caproic) inhibited growth of Salmonella almost completely in the culture media when tested by the sensitivity and the pour plate methods. When the stated fatty acids were added to meat and bone meal inoculated with Salmonella, no viable organisms could be recovered from the meal samples.

The authors conclude that fatty materials, particularly the low molecular weight volatile fatty acids, exert inhibitory effects against Salmonella in culture media and in a high protein meal; some of these fatty acids exhibit a bactericidal effect. These findings may be useful in developing feed formulations using nontoxic naturally occurring ingredients to control Salmonella in products produced by the rendering and allied industries. [2 tables, 9 references]

0.4 DRUG SAFETY: EXPERIMENTAL PROGRAMS

Zbinden, Gerhard (Department of Medicine, University of Cambridge, Cambridge, England)
Science 164, No. 3880, 643-647 (May 9, 1969)

The author critically reviews the problems of testing toxicity of drugs during the past 10 years. In the final section dealing with future developments, the author states that the fundamental problem of toxicology cannot be solved by a limited effort of a drug manufacturer--the scientific problems will have to be identified and their solution sought through the coordinated efforts of many. For example, a study of the relation between long-term abuse of analgesic mixtures containing phenacetin and the incidence of interstitial nephritis is being coordinated by the World Health Organization and involves epidemiologists, clinical pharmacologists, immunologists, and experimental toxicologists in the United States and Europe. Other problems that require large-scale collaborative investigations include the question of the mutagenic effect of chemicals, the importance of chemicals as a cause of autoimmune diseases, and the long-term effects of enzyme inhibition and stimulation. [11 references]

Abstracter: F. T. Piskur

0.6 TENDERNESS OF FREEZE-DRIED CHICKEN TREATED WITH PROTEOLYTIC ENZYMES

Dawson, L. E., and G. H. Wells (Department of Food Science, Michigan State University, East Lansing 48823)
Poultry Science 48, No. 1, 64-70 (January 1969)

During the freeze-drying process, cooked poultry meat becomes less tender. To tenderize the poultry meat, proteolytic enzymes can be added to the solution used for rehydration. However, several factors, such as pH of the reconstitution solution, may affect the activity of the enzymes and the tenderness of the final product. The purpose of this research was to examine the effects of enzyme (ficin, bromelin, papain, and Rhozyme P-11) concentration, temperature, and pH of the reconstitution solution on the tenderness of meat from old hens and to establish one optimum set of conditions for these three factors.

The enzymes were incorporated directly into the rehydration solutions. The freeze-dried samples of white meat were rehydrated in the enzyme solutions for 5 min. The enzymes were inactivated by heating the reaction mixture for 3 min. at 100° C.

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Abstracter: F. T. Piskur

0.7 THE EFFECTS OF DEBEAKING, FLOOR SPACE, AND
(Cross Ref.: 6.19) DIET ENERGY LEVELS ON BROILER GROWTH

Andrews, L. D., and T. L. Goodwin (Animal Science Center, University of Arkansas, Fayetteville, 72701)
Poultry Science 48, No. 1, 191-196 (January 1969)

The experiments report on the effect of debeaking, floor space per broiler, and productive energy level of the ration on the growth and feed efficiency of different strains of broilers.

The ration with the medium energy value produced broilers with a lower average body weight than rations with high or very high energy. The rations with high and very high energy levels were more efficient than the ration with a medium energy level. The pens with 7.4 square decimeters of floor space per bird were more efficient than pens with 3.7 and 4.7 square decimeters per bird.

The ration with the medium energy level produced broilers with heavier average body weight than the rations with high or very high energy levels. The levels of debeaking had no effect on average body weight or feed efficiency. The feed efficiency of the ration with the medium energy level was significatly lower than that for the rations with high or very high energy levels.
[3 tables, 15 references]

Abstracter: F. T. Piskur

0.7 INFLUENCE OF VARIOUS LEVELS OF LYSINE INTAKE ON WEIGHT GAIN AND BODY COMPOSITION OF RATS

Chang, Y. O., and Nancy Chao (Division of Biochemistry, University of Wyoming, Laramie 82070)
Journal of Agricultural and Food Chemistry 17, No. 1, 48-50 (January-February 1969)

Proteins of plant origin are low in lysine. Lysine deficiency in animals results in slow growth, low levels of serum protein and serum protein components, high fat in the liver, low weight of the liver, and poor bone calcification. When rats are fed a diet containing a low level of plant protein supplemented with a slight excess of lysine, growth of the animals is often retarded as a result of amino-acid imbalance. The purpose of the present study was to examine the changes in composition in the body of rats at various levels of lysine intake and the possible effect of feeding rats a high lysine diet that contains a level of protein sufficiently high to support maximal growth.

The rats were fed various levels of lysine in a basal diet containing 18 percent wheat gluten. The basal diet contained no added lysine. Other diets were supplemented with lysine in the amounts of 0.20, 0.4, 0.8, 1.6, and 3.2 percent. Body weight and serum protein, serum albumin, and bone-calcium concentrations increased in rats fed the lysine-supplemented diet and reached a maximum at the 0.4 percent level of lysine in the diet. Lysine supplementation of the diet increased the urinary excretion of lysine. The concentration of glycogen and of

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Abstracter: F. T. Piskur

0.6 (Cross Reference: 0.38)

The results are summarized as follows:

Enzyme used to tenderize freeze-dried white meat from old hens	Optimum characteristics of the rehydration solution		
	Enzyme concentration weight/volume	pH	Temperature ° C.
Ficin	0.008	5.0	70
Bromelin	0.002	5.0	60
Papain	0.002	7.0	50
Rhozyme P-11	0.02	5.0	50

[6 figures, 2 tables, 20 references]

0.7 (Cross Reference: 6.195)

fat in the liver of the rat was lower in the animals fed the basal diet supplemented with lysine. [5 tables, 16 references]

0.7 (Cross Reference: 7.67)

COMPOUNDS WITH VITAMIN E ACTIVITY

Anonymous
Nutrition Reviews 27, No. 3, 92-94 (March 1969)

Certain compounds, unrelated structurally to vitamin E, are able to replace the vitamin for various biological functions. These compounds are antioxidants, except possibly for selenium. To produce the biological effect, such compounds must be used in larger amounts on a molar basis than α-tocopherol.

Substituting an amino group for the hydroxyl in the tocopherols does not change their biopotency. Replacing a hydrogen in the amino group of the β- or γ-tocopherol derivatives increases their activity to that of α-tocopherol. The monomethylamine derivatives of α-tocopherol are unable to prevent exudative diathesis or encephalomalacia in chicks. [Abstracter: F. T. Piskur]

0.7 (Cross Reference: 6.195)

EFFECT OF PROTEIN LEVEL ON CARCASS COMPOSITION OF TURKEYS

Bixler, E. G., G. F. Combs, and C. S. Shaffner (Department of Poultry Science, University of Maryland, College Place 20742)
Poultry Science 48, No. 1, 261-266 (January 1969)

Donaldson et al. (1956) found that, when the ratio of energy to protein in the diet of chicks widened, the energy intake and carcass fat deposition increased and the body water decreased. In the present studies, four experiments were carried out with Maryland Medium White poults to determine the effect of a low-protein diet on feed consumption, rate of weight gain, and body composition. The low-protein diet used was first limiting in lysine.

Poults fed low-protein diets during the period from 2 to 4 weeks or the period from 4 to 8 weeks of age gained less rapidly in weight of body and consumed significantly more feed per unit gain than did the control group. Analysis of the carcasses at 4 weeks in the experiment where the poults were fed a low-protein diet during the period from 2 to 4 weeks of age revealed that poults fed a low-protein diet showed increases in body fat and decreases in body protein and water content as compared to the control group.

The differences found in the performance of fast- and slow-growing families suggest that genetic selection (based on rate of gain of poults fed a low-protein diet) might be used as a means of improving the ability of turkeys to fatten. [5 tables, 13 references] [Abstracter: F. T. Piskur]

0.7 (Cross Reference: 6.195)

PROTEIN AND SULFUR AMINO ACID REQUIREMENT OF THE LAYING HEN AS INFLUENCED BY DIETARY FORMULATION

Harms, R. H., and B. L. Damron (Florida Agricultural Experiment Station, Gainesville, Florida 32601)
Poultry Science 48, No. 1, 144-149 (January 1969)

In 1966, the National Research Council suggested that laying hens require 15 percent protein in a diet containing 2,850 kilocalories of metabolizable energy per kilogram. Furthermore, the diet should contain 0.28 percent methionine and 0.25 percent cystine. The purpose of the present study was to determine the influence of various levels of total protein and sulfur amino acids upon the methionine requirement of the laying hen. The work involved two 280-day experiments with laying hens. Test measurements were: rate of egg production, feed consumed per dozen eggs, body-weight gain, and weight of eggs from pullets (Hy-Line 934-H).

Apparently, the hen requires from 0.25 to 0.28 grams of methionine daily provided she is supplied a total of 0.53 grams of sulfur amino acids. These requirements were met by using a level of 0.268 percent methionine and 0.533 percent total sulfur amino acids in a diet containing 2,887 kilocalories of metabolizable energy per kilogram. The stated level of methionine did not support maximum performance when the diet contained lower levels of total sulfur amino acids. [4 tables, 8 references] [Abstracter: F. T. Piskur]

1.0147 A NEW FORCE IN DEEP SEA FISHING -- GDR'S FLEET'S RAPID BUILD-UP FROM LUGGER TO MOTHER SHIP

Anonymous
World Fishing 18, No. 2, 24-26 (February 1969)

One of the effects of the partition of Germany after World War II was the loss by what is now the German Democratic Republic (GDR) of her North Sea ports. Only the major Baltic port of Rostock remained, and the fishery along the Baltic coast was primarily dependent on luggers that fished for herring, sprat, and various kinds of white fish.

Today the GDR fleet has become a highly sophisticated, distant-water flotilla fleet. Technical advances in machinery and fish handling, though made in comparative isolation from those in the west, have been remarkable, suggesting that development in comparative isolation may have distinct advantages, since research and development people do not have to overcome existing prejudices or restrictive attitudes. Of course, investments in development of the industry, the ships, and the equipment and in training programs for the crews have been guaranteed by long-term contracts with the U.S.S.R.

Fish consumption in the GDR has nearly doubled since the fleet-rebuilding program began; per capita consumption is expected to reach 24 lb. a year by 1970.

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2.12 IMPROVING TRAWL GEAR AND PURSE SEINE PERFORMANCE BY DESIGN

Foster, J. J. (Gear Research Unit, Aberdeen Marine Laboratory, Department of Agriculture and Fisheries, Aberdeen, Scotland)
World Fishing 18, No. 2, 32-33 (February 1969)

Trawl gear.--Several attempts have been made to produce standard formulas for the relation between net, otterboard size, and total available thrust of the vessel. However, so many variables have to be taken into account that most tables derived from such formulas are useless. Nevertheless, simple practical tests can be made with very limited instrumentation. The author's Unit made such tests on an otterboard trawl.

The gear tested was being used on a 110-hp. vessel. It consisted of a bottom trawl with a 44-ft. headline and standard 4-ft. V-type otterboards. Catch results were consistently poor, regardless of the speed of the vessel. After measuring the total load, the divergence of the warps at the ship, and the headline height, the researchers calculated that 5-ft. V-type boards would give better results. With this change, the board spread, calculated from divergence, increased from 40 to 80 ft.; the measured headline height dropped from 6 to 3 ft.; and the wing ends were drawn down to run almost on the bottom. Although the tension, measured at the ship, increased about 110 lb., the vessel had ample reserve power to handle the small increase.

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2.05 STUDIES ON PATHOGENIC PROPERTIES OF AEROMONAS LIQUEFACIENS-- II. SEPARATION OF TOXIC FACTORS BY GEL FILTRATION

Shimizu, Tomoko (Dept. of Fisheries, Fac. of Agriculture, University of Tokyo, Bunkyo-ku, Tokyo, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 35, No. 2, 163-170 (February 1969)

In the first part of this study, the author reported that some motile strains of Aeromonas isolated from eel infections would cause the same type of hemorrhage, necrosis, and eventual death in inoculated eels that the natural infections caused. The cell-free extract prepared after sonic treatment caused the same typical symptoms as did the living organisms, not only in eels but in mice and guinea pigs. In order to clarify the pathogenicity of Aeromonas, he needed to know what kind of substance generated by the cell could cause such toxic reaction in the animals. Therefore he undertook to fractionate cell-free preparations by gel filtration on Sephadex G-100 as the first step toward identifying and characterizing the pathogenic substances of Aeromonas.

The 50,000×g. centrifugal supernatant of a sonicated cell suspension of A. liquefaciens strain Y-62 was gel filtered on a Sephadex column. Factors causing death in the mouse and the guinea pig and hemorrhage in the guinea pig's skin passed through the Sephadex gel without disparsing [dispersing?], whereas those causing hemorrhage and necrosis in the eel's skin and necrosis in the guinea pig's

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2.140 MAKING FISHING MORE EFFICIENT

Drever, Charles, et al.
World Fishing 18, No. 4, 18-19 (April 1969)

Among the technical developments needed to make the fishing industry more efficient are improved forms of fish-detection equipment; navigational aids and communications systems that have a wider, more accurate range; more highly automated gear for use in handling and processing fish; and a type of net and gear, and associated instrumentation, that can be adapted to whatever particular formations the fish may be in. Some of the specific instruments mentioned in this general survey of the fisherman's needs include a more flexible trawl, a searching sonar that will permit aimed fishing, a device that would indicate accurately the weight of fish in the bag, an acoustic device capable of looking into hollows of the sea bed, and a means of forcing the fish to congregate before the trawling run is made. The roles of the owner, the fisherman, the manufacturer of the equipment, and the Government in the ultimate introduction and application of these instruments are discussed, and the problems they face in performing their particular role are acknowledged.

Other reinforcements needed to ensure more efficient fishing include: an increased knowledge about basic fish behavior; expert instruction in the use of

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1.0141 (Cross Reference: 9.4)

NORWEGIANS AIM FOR A SELF-SUFFICIENT INDUSTRY

Stewart, A. I. B.
World Fishing 18, No. 2, 27-29 (February 1969)

The author explains the structure of the Norwegian Government's fishing subsidy system and discusses the functions and interrelations of the Government, the Fish Sales Organizations, and the Norwegian Fishermen's Union (the only association of fishermen in Norway--and the largest in Europe). Subsidies are paid for price support, gear, bait, increased efficiency (for example, scrapping of old vessels or equipment, acquisition of new vessels, experimental work and exploratory surveys, or improvements in processing or marketing techniques), insurance (the additional costs for distant-water fishing are paid wholly by the Government), and a guaranteed minimum wage (the equivalent of about $28 a week to bona fide full-time fishermen). Over 230,000,000 kroner will be paid this year. The Government's policy is that these subsidies should be applied in such a way that the industry will eventually be self-supporting. [5 photographs]

[Abstracter: L. Baldwin]

1.0147

The increase has been helped along by an effective press and television campaign. Further expansion of the fishery seems to be imminent--a new factory at Straumsund is being built solely to supply cans for fish plants, and plans are being made to fish for horse mackerel off the coast of South Africa and conduct exploratory fishing operations in the Antarctic. [11 photographs]

2.05

skin were dispersed in Sephadex gel. These activities were not separable. The findings indicate that the sonic extract of Aeromonas contains at least two different toxic substances. [3 figures, 2 tables, 9 references]

2.12 (Cross References: 2.1121, 2.1125, 2.1471)

A larger net was then used with the 5-ft. otterboards. This modification, which increased the overall drag about 20 percent, plus otterboard spreads and headline heights that were approximately midway between those produced during the first trial and those produced by the vessel's original gear, improved the catch rate considerably.

Purse seine.--The Unit also designed a small purse seine that could be operated from a small vessel fishing for perch that aggregate about 25 ft. from the bottom in water about 75 ft. deep. The net was 220 ft. long and 75 ft. deep; when pursed, it had the shape of a bowl about 35 ft. deep and 45 ft. across the headline. Divers monitoring its operation noticed that the openings at the sides provided an escape route for the fish that were in the net when the bottom of the bag was closed. Hauling the sidelines till the sole ropes were up before pursing was begun, together with changes in the way the ends of the net were tailored, effectively closed the fish's escape route.

Pair-trawling.--The Unit, in collaboration with British, French, and Scandinavian research workers, also studied pair-trawling. All seem to agree in general with the following theoretical values for a pair-trawling operation:

1. The lead-in angle of the warps should be between 12 and 17 degrees.
2. No increase in the length of the bottom spreading wires is necessary during deep-water fishing unless extra weight is added to the lower bridle. Then, with a 30-fathom bridle, for example, 1 fathom should be allowed for an extra 350 lb., 1.5 fathoms for 500 lb., 3 fathoms for 700 lb., and 4 fathoms for 900 lb.
3. The distance between the two boats is governed by the length of the warp paid out aft: for a 200-fathom warp, the distance should be 90-120 fathoms; for a 150-fathom warp, 60-90 fathoms; for a 100-fathom warp, 40-60 fathoms; and for a 50-fathom warp, 20-30 fathoms. [2 figures]

2.113 KORROSIONSSCHUTZ VON STAHL DURCH ANSTRICHE III
[CORROSION PROTECTION OF STEEL BY MEANS OF PAINTS - III]

Van Oeteren, K. A. (Hilden, Rhineland, West Germany)
Fette-Seifen Anstrichmittel 71, No. 2, 121-128 (February 1969) (In German)

[2 figures, 3 tables, 72 references]

2.113 CORROSION RESISTANCE AT THE POINTS OF WELDING AND BENDING OF DIFFUSION ZINC-COATED PIPE

Proskurkin, E. V., N. S. Gorbunov, and N. A. Lavrenko (Vses. Nauch.-Issled. Inst. Trub. Prom., U.S.S.R.)
Chemical Abstracts 70, No. 12, 49769s (March 24, 1969)

2.140

all new forms of instrumentation; pools of information about positions and rates of catch; and, above all, close cooperation between the fishing industry, research organizations, and the manufacturer of equipment. [4 photographs]

2.3 MODERNE DESINFEKTIONSMETHODEN IN DER LEBENSMITTELWIRTSCHAFT
[MODERN METHODS OF DISINFECTION IN THE FOOD INDUSTRY]

Edelmeyer, H. (Th. Goldschmidt Corporation, Essen, West Germany)
Fette-Seifen Anstrichmittel 71, No. 2, 152-156 (February 1969) (In German; English abstract)

Methods of cleaning surfaces and of disinfecting equipment and personnel are described. Venturi equipment and dosing centers are optimum means of disinfection; hands and utensils can be treated in these areas. Spraying devices are good for disinfecting surfaces and apparel; recirculation procedures can be used to disinfect pipelines. [3 figures, 27 references] [Abstracter: L. Baldwin]

3.239 COMPARATIVE RATES OF IMP DEGRADATION IN UNFROZEN AND FROZEN-AND-THAWED (SLACKED) FISH

Kemp, Barbara, and John Spinelli (Technological Laboratory, Bureau of Commercial Fisheries, U.S. Fish and Wildlife Service, Seattle, Washington 98102)
Journal of Food Science 34, No. 2, 132-135 (March-April 1969)

Some of the chilled fish in retail markets are previously frozen fish that have been thawed prior to or during display. The ultimate quality of such fish is related to the condition of the frozen fish just prior to thawing and to the subsequent thawing conditions and storage periods. Recent studies have shown a correlation between loss of flavor and degradation of the nucleotide IMP (inosine monophosphate) in thawed fish stored in ice. IMP is formed in fish through a series of enzymatic reactions. Freezing, frozen storage, and thawing of fish can alter the enzymatic activity in fish tissues. The altered enzyme activity may in turn have an effect on the quality of the thawed fish. The purpose of the present work, then, was (1) to compare the rate of degradation of IMP during refrigerated storage of thawed fish and of fish not previously frozen and (2) to examine the effect of freezing and storing conditions on the rate of degradation of IMP during refrigerated storage of the thawed fish. Samples of silver salmon, king salmon, halibut, rainbow trout, English sole, and Dover sole were used. The various experimental conditions considered were (1) method of killing the fish, (2) freezing of fish pre- or postrigor, (3) temperature of freezing of fish, and (4) storage period of the frozen fish.

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 Abstracter: F. T. Piskur

3.336 ASEPTIC PROCESSING AND PACKAGING

Hersom, A. (Cross & Blackwell Ltd.)
Food Manufacture 44, No. 4, 28-34 (April 1969)

The conventional method of sterilizing foods is a relatively lengthy process because of the slow rate of heat transfer. If rapid heat-transfer can be achieved, then higher temperatures with correspondingly shorter cooking times may be used. However, the thermal destruction rate for bacterial spores must be examined in light of the rate of loss of desirable organoleptic and nutritive properties of the food. The application of high-temperature, short-time processes is limited by considerations of enzyme deactivation and by the practical difficulties of achieving, controlling, and monitoring a rapid heat-transfer process. To take full advantage of the high-temperature, short-time effect, one must heat the food rapidly to temperatures above 130° C., cool it rapidly, and then seal it in a sterile container under aseptic conditions.

Foods processed according to this procedure often are of better quality than are similar foods processed by conventional methods. Yet processors have been slow to accept the method, possibly because of the mechanical difficulties attendant upon its use and because of the problem of obtaining a foolproof aseptic filling system. In their search for ways to produce higher quality foods, however, they are exerting considerable development effort on the improvement of

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 Abstracter: L. Baldwin

3.2491 STUDIES ON THE RETENTION OF MEAT COLOR OF FROZEN TUNA--VI. EFFECT OF PLASTIC FILM PACKAGING AND ICE-GLAZING ON THE RATE OF DISCOLORATION

Bito, Masamichi (Tokai Reg. Fish. Res. Lab., Kachidoki, Chuo-ku, Tokyo, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 35, No. 2, 218-226 (February 1969) (In Japanese; summary and figures in English)

Tuna meat packaged in three kinds of material having different air permeabilities was examined for color retention following frozen storage. The packaging materials were laminated-aluminum foil (in ordered layers of cellophane, polyethylene, aluminum, and polyethylene), a cellophane-polyethylene laminate, and a polyethylene film. The effect of glazing the tuna meat with ice was also examined.

Tuna meat vacuum packed in laminated-aluminum foil and stored at 2° C. discolored at a much slower rate than did that packed in polyethylene film. The surface of tuna packed in polyethylene film and stored at -10° and at -20° C. discolored at the slowest rate, whereas the tuna that was vacuum packed raw in aluminum foil discolored fastest; the discoloration rate of the vacuum packed frozen meat was midway between these two. The discoloration rates of the inner portions, however, were similar. The discoloration rate of tuna vacuum packed in cellophane-polyethylene laminate was similar to that of the tuna vacuum packed in aluminum foil.

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 Abstracter: L. Baldwin

4.11 SEPARATION OF TRIGLYCERIDES AND FREE FATTY ACIDS ON SEPHADEX LH-20

Addison, R. F., and R. G. Ackman (Fisheries Research Board of Canada, Halifax Laboratory, P.O. Box 429, Halifax, Nova Scotia)
Analytical Biochemistry 28, Nos. 1-3, 515-522 (April 4, 1969)

During gradient elution chromatography of lipid extracts on silicic acid, separation of free fatty acids (FFA) from triglycerides (TG) is difficult if the FFA's are present in large amounts. Usually, the FFA's are separated from the lipids by saponification and extraction, adsorption on Florisil or alumina, or on ion-exchange resins. Molecular seiving would appear to be a suitable method for separating such mixtures. Nyström and Sjövall (1965) showed that FFA's and TG's were eluted with different volumes of chloroform-based solvents from partially methylated Sephadex G-25 and reported that similar separations seemed probable on the commercially available hydroxypropyl analog, Sephadex LH-20. However, few data are available concerning loads, resolution of natural mixtures, or recoveries from columns of this type. The report here describes the fractionation of some model and some natural TG-FFA mixtures on Sephadex LH-20.

Free fatty acids and triglycerides were separated by elution with chloroform or chloroform + 0.2 percent (v/v) acetic acid from columns of Sephadex LH-20. The behavior of the FFA's during elution suggests that adsorption may play a major role in TG-FFA separations. Fractionation of FFA's according to chain length

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 Abstracter: F. T. Piskur

3.2491 (Cross References: 1.12, 3.2380)

The surface portion of tuna given a glaze of ice before storage at -12° and -20° C. discolored faster than that of tuna packed in polyethylene film and stored at the same temperature; the inner portions discolored almost identically. Ice-glazed tuna stored at -35° C. discolored very slightly.
[7 figures, 10 references]

4.4 (Cross Reference: 4.29)

THERMAL DEGRADATION OF LIPIDS. A REVIEW

Nawar, Wassef W. (Department of Food Science and Technology, University of Massachusetts, Amherst 01003)

Journal of Agricultural and Food Chemistry 17, No. 1, 18-21 (January-February 1969)

The author reviews information on the reactions induced in lipids by application of heat under nonoxidative conditions. Reactions known to occur in fats during nonoxidative heating are: dehydration, decarboxylation, hydrolysis of the ester bond, double-bond conjugation, polymerization, dehydrocyclization, aromatization, dehydrogenation, and degradation by carbon-carbon cleavage. Free fatty acids may be formed upon heating in both the absence and the presence of moisture. During the hydrolysis of triglycerides by heat, the shorter chain and the unsaturated fatty acids are preferentially released, but apparently the position of the fatty acid had no effect on the rate of its hydrolysis by heat. The author discusses the mechanisms of the formation of lactones, methyl ketones, hydrocarbons, and monocarboxylic and decarboxylic methyl esters in heated fats. [Abstracter: F. T. Piskur]
[8 figures, 1 table, 27 references]

3.2383

WIRTSCHAFTSTEIL
STYROPOR -- SCHAUMSTOFF-VERPACKUNG FUR FRISCHEN FISCH
[MANAGEMENT SECTION
STYROPOR -- FOAM PACKAGING MATERIAL FOR FRESH FISH]

Kraft, W. (Mussbach on Weinstrasse, Germany)

Fette-Seifen Anstrichmittel 71, No. 2, 173-175 (February 1969) (In German)

The increasing need for and importance of fish are reviewed, and the problems of getting a quality product to the consumer are mentioned. The advantages of packaging, storing, and transporting fish fillets in Styropor containers are described, particularly those that derive from its light weight and easy handling. [Abstracter: L. Baldwin]
[4 figures, 6 references]

3.239 (Cross Reference: 2.03)

The rate of degradation of IMP in the flesh of English sole and rainbow trout during refrigerated storage was slightly greater for the samples that were frozen and thawed within 48 hr. than for the samples that were chilled (not previously frozen). The rate of degradation of IMP in the flesh of silver salmon and halibut during refrigerated storage was the same as the samples that were frozen and thawed within 48 hr. and the samples that were chilled (not previously frozen).

The rate of degradation of IMP in the flesh of halibut during refrigerated storage was slightly less for the samples stored at -20° F. for 3 months than thawed than for the samples that were chilled (not previously frozen); but king salmon handled under the same conditions showed no decrease in the rate of degradation of IMP.

The method of killing the fish or of freezing the fish before or after rigor did not alter the rate of degradation of IMP during refrigerated storage of the thawed samples.

No loss of IMP occurred in halibut stored at -20° F. for 3 months; however, over one-third of the IMP content was lost in halibut stored at +15° F. for the same period.

The authors conclude that the flavor-contributing effect of IMP in thawed fish should be the same as in fresh (chilled) fish provided that the fish was frozen and stored at -20° F. or lower. [7 figures, 11 references]

4.11 (Cross Reference: 7.773)

shows that molecular size also may have some effect. Addition of small amounts of acetic acid to chloroform was useful in reducing the tailing of the FFA's. Loads of up to 10 mg./g. dry weight of gel were used, and no loss of resolution attributed to overloading was observed. The recovery of artificial and natural mixtures was better than 95 percent. [2 figures, 3 tables, 11 references]

3.336 (Cross References: 0.12, 3.238)

processing methods. The author suggests that aseptic processing and packaging techniques will, in due course, be extended to foods not presently treated in this way.

The article is divided into two main parts: product sterilization and aseptic packaging. The first part includes descriptions of the plant equipment needed for aseptic processing and the design of plants producing different types of product. It discusses the problems involving instruments and efficient heat transfer, and gives a rather full description of one plant that uses each of the three main types of heat exchange (injecting steam into the product; introducing the product into steam; and subjecting the product to indirect heat from heat exchangers of the plate, tube, or swept-surface type).

The second part of the article contains a discussion of the types of packages that are suitable for aseptic packaging; a description of the aseptic cartoning operation and an examination of its relation to the character of the product; and an overview of various systems of packaging, including a discussion of the types of containers and caps being used. [7 figures, 13 references]

Nakamura, Kuntsuke, Kuntsugu Kitchavashi (Tokai-Ku Fish. Res. Inst., Tokai, Japan)
Chemical Abstracts 70, No. 3, 18978 (February 3, 1969)

4.5 AUTOXIDATION OF FATTY ACID LIPIDS AND CAROTENE OF FREEZE-DRIED AVOCADO SALAD

Lime, Bruce J. (Southern Utilization Research and Development Division, Agricultural Research Service, U.S. Department of Agriculture, Weslaco, Texas)
Food Technology 23, No. 4, 171-174 (April 1969)

Earlier studies by Lime (1969) suggested that autoxidation of unsaturated fatty acids in freeze-dried avocado salad stored in air contributed to the development of off-flavor. The presence of unsaturated fatty acids and carotenes together has an influence on the autoxidation of each, and the extent of this influence seems to vary under different conditions. Avocados contain both unsaturated fatty acids and carotenes. The present paper reports on a study of the changes in the fatty acid lipids and carotene fractions of stored freeze-dried avocado salad and of an evaluation of the influence of unsaturated fatty acids and carotene on the autoxidation of each other.

The avocado salad mixture contained 88.7 percent avocado meat, 4.6 percent lemon juice, 0.27 percent onion powder, 1.43 percent salt, and 5.0 percent cracker meal. The mixture was freeze dried to approximately 2.8 percent moisture. Samples were packed in cans and sealed in air and under vacuum. Lots of each were stored at 100° F. and 68° F.

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6.54 FISH PROTEIN CONCENTRATE AS A SUPPLEMENT TO CEREAL DIETS

Munro, I. C., A. B. Morrison, and M. Myer (Research Laboratories, Food and Drug Directorate, Department of National Health and Welfare, and Department of Fisheries, Ottawa, Ontario, Canada)
Journal of the American Dietetic Association 54, No. 5, 398-400 (May 1969)

This report deals with the supplementary value of fish protein concentrate (FPC) in diets based on the protein of rice, beans, peas, and wheat. The FPC was prepared by freeze-drying codfish (Ghadus morhue [Gadus morhua]) fillets.

Two lots of four representative Middle Eastern diets were prepared: one lot of each of the four diets did not contain added FPC; the second lot of each diet contained 5 percent added FPC. Each diet was analyzed for total and "available" lysine and total methionine and cystine. The protein efficiency ratio (PER) was also determined.

Rats receiving the diets supplemented with FPC had higher food intakes and weight gains than did those given the unsupplemented diets. The addition of as little as 1.53 percent FPC to the diets resulted in substantial weight gains. The PER values for most diets were significantly increased by the addition of FPC. FPC increased the PER of rice diets to a greater extent than did isonitrogenous amounts of skim milk powder.

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6.195 EFFECTS OF SEVERE ALKALI TREATMENT OF PROTEINS ON AMINO ACID COMPOSITION AND NUTRITIVE VALUE

De Groot, A. P., and P. Slump (Central Institute for Nutrition and Food Research TNO (CIVO), Zeist, The Netherlands)
Journal of Nutrition 98, No. 1, 45-56 (May 1969)

Alkali treatment is applied in certain commercial processes for dissolving proteins in the preparation of concentrates and isolates, for destruction of aflatoxin in groundnuts, and for other purposes. Several workers have noted that alkali treatment of wool, enzymes, and serum albumin may induce chemical changes in the proteins, leading to the formation of new amino acids. The amino acids involved are cystine, lysine, arginine, and possibly serine. The possibility exists that alkali treatment of food proteins may induce similar chemical changes in and may impair the nutritive value of the protein. The experiments reported in this paper were undertaken to evaluate the effects on food proteins of alkali treatments varying in pH, temperature, and duration. The treated proteins were evaluated by amino-acid analyses, protein quality assays, in vitro digestion and absorption tests, and feeding studies with rats. Products tested were: soybean oil meal, casein, sodium caseinate, vegetable confectionery product (commercial foaming agent), animal confectionery product (commercial foaming agent), animal protein concentrate [not further identified], groundnut meal, coconut meal, sesame protein, and Brewer's yeast protein.

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6.61 KIND AND CONCENTRATION OF SOLUBLE PROTEIN EXTRACT AND THEIR EFFECT ON THE EMULSIFYING CAPACITY OF POULTRY MEAT

Maurer, A. J., R. C. Baker, and D. V. Vadehra (Cornell University, Ithaca, New York 14850)
Food Technology 23, No. 4, 177-179 (April 1969)

Food emulsions have been manufactured on an empirical basis for many years, but only recently have studies been carried out on the factors that influence the formation and stability of emulsions. [Frankfurters and certain sausages, for example, are emulsion-type food products.] Many chemicals and certain physical conditions affect the emulsion capacity of meats. The purpose of the present study was to determine the usefulness of the soluble proteins in poultry meat in emulsion products. Factors investigated were the various carcass parts, type of protein extract, and concentration of soluble protein. Efficiency of the soluble protein was determined by measuring the emulsifying capacity. The protein solution was blended with cottonseed oil in an Osterizer under standarized conditions. Emulsifying capacity was expressed as the milliliter of cottonseed oil emulsified by 100 mg. of soluble protein.

The protein in solutions at low concentrations were more efficient as emulsifiers than the proteins in solutions of higher concentrations. Those proteins extracted in the presence of salt (NaCl) showed a greater emulsifying efficiency

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6.195 (Cross Reference: 6.50)

Treatment of food proteins with alkali at pH 12.2 resulted in the formation of the amino acid derivative lysinoalanine (LAL), which is poorly absorbed. When isolated soy protein (ISP) was exposed to alkali at pH 12.2, the LAL formed increased with rising temperature and with time of exposure. The appearance of LAL in the treated proteins was attended by a decrease in the amount of cystine and lysine, and a decrease in the net protein utilization (NPU) values. Severe treatment of ISP (pH 12.2 at 60° or 80° C.) caused, in addition, a decrease in the content of serine and a decrease in the digestibility of the protein. The LAL content of the alkali-treated ISP showed a highly significant negative correlation with NPU values (r = -0.96). The LAL content of proteins treated with alkali is a good criterion for measuring alkali damage. The NPU assays of ISP supplemented with amino acids showed that methionine was the first limiting amino acid and threonine was the second. Amino acid supplementation of alkali-treated ISP could not completely alleviate its decreased NPU, probably because of decreased utilization of threonine. Pepsin-pancreatin digestion of alkali-treated ISP released most of the essential amino acids at a relatively slow rate. Methionine and threonine from the treated protein showed a decreased rate of absorption in vitro. Feeding studies with treated proteins did not show any deterimental effects on rats other than, in females, an increased degree of nephrocalcinosis that could be prevented by addition of dietary calcium.
[7 tables, 26 references]

6.61 (Cross Reference: 0.32)

than the proteins extracted with water when the emulsifying capacities were determined at the higher protein concentration levels. Addition of NaCl to the protein extracts enhanced the emulsifying capacity of the protein solution.

All carcass parts provided extracts with similar emulsifying capacities when tested in solutions of equal protein concentrations. The various carcass parts, however, contained different amounts of total and soluble proteins.
[3 figures, 1 table, 11 references]

6.32 AUTOLYSIS OF CHLORELLA

Chernykh, S. I. (U.S.S.R.)
Chemical Abstracts 70, No. 3, 19033e (February 3, 1969)

6.32 EXPERIMENTAL DETERMINATION OF THE CONTENT OF VITAMIN B_{12} AND TOXIC SUBSTANCES IN BLUE-GREEN ALGAE

Milova, S. M. (Inst. Gidrobiol., Kiev, U.S.S.R.)
Chemical Abstracts 70, No. 3, 17663m (February 3, 1969)

4.5

The concentration of the unsaturated fatty acid portion of the lipids showed no significant decrease for periods of up to 48 weeks; however, the carotene content decreased rapidly in the air packs.

When methyl linoleate and carotene, methyl linolenate and carotene, and mixtures of these were exposed to air, the peroxide values of the esters remained low until the carotene had been oxidized. The rate of oxidation of carotene in the presence of the methyl esters was significantly higher than the rate of oxidation of carotene in the absence of the methyl esters.

The authors theorize that the peroxides of unsaturated methyl esters formed in the presence of carotene react with the carotenes and thus have a sparing effect on the overall oxidation of the unsaturated fats. This theory helps explain the apparent stability of the unsaturated fats in freeze-dried avocado salad stored in air. [6 figures, 4 tables, 20 references]

4.61 USE OF ANTIOXIDANTS AS A PRESERVATIVE FOR FAT-CONTAINING PRODUCTS, SUCH AS FISH

Pozhogina, P. M., V. V. Ruus (Baltic Scientific-Research Institute of the Fish Industry)
Chemical Abstracts 70, No. 3, 19038k (February 3, 1969)

6.54

The authors suggest that relatively small amounts of good quality FPC could be of considerable value in supplementing the diets of human populations that subsist on diets containing inadequate amounts of cereal protein.
[4 tables, 9 references]

6.134 ON THE USE AND "MISUSE" OF CYCLONE SEPARATORS

Uevik, A. O.
Meldinger fra SSF, No. 4, 161-166 (October 1968) (In Norwegian)
World Fisheries Abstracts 20, No. 1, 45-46 (January-March 1969)

A short description of the cyclone separator is given and the flow patterns, dimensions, collection efficiency, and pressure drop are discussed. The author emphasizes that for a given amount of air a higher efficiency is achieved when several cyclone separators are operated in parallel than when one large unit is used. Finally, the author discusses the use of cyclone separators in the herring meal industry. [Extractor: F. T. Piskur]

7.50 FRACTIONATION OF FLUORESCENT-LABELED PROTEINS ACCORDING TO THE DEGREE OF LABELING

Kierszenbaum, Felipe, Stuart A. Levison, and Walter B. Dandliker (Department of Biochemistry, Scripps Clinic and Research Foundation, La Jolla, California 92307)
Analytical Biochemistry 28, Nos. 1-3, 563-572 (April 4, 1969)

The technique of labeling macromolecules as tracers is often used in the study of chemical mechanisms and molecular interactions. Fluorescent labeling of macromolecules has been particularly useful in measuring absolute values of rotational relaxation times, in detecting conformational changes as reflected in Brownian motion, and in characterizing macromolecular equilibria and kinetics. However, labeling may significantly alter the native structure and properties of the macromolecule. Also, labeling leads to a heterogenous population of labeled species that may differ in their chemical and biological reactivity. The present paper describes a method for separating labeled materials into fractions according to their degrees of labeling. The authors found that narrow fractions of relatively uniformly fluorescent-labeled molecules can be obtained by preparative acrylamide gel electrophoresis or by gel filtration on Sephadex G-100. [5 figures, 21 references]

 Abstracter: F. T. Piskur

7.81 (Cross Ref.: 2.00) ASSESSMENT OF GREEN TUNA: DETERMINING TRIMETHYLAMINE OXIDE AND ITS DISTRIBUTION IN TUNA MUSCLES

Yamagata, M., K. Horimoto, and C. Nagaoka (Japan Frozen Foods Inspection Corporation, Tokyo, Japan)
Journal of Food Science 34, No. 2, 156-159 (March-April 1969)

Previous work (Koizumi et al., 1965; Nagaoka et al., 1962 and 1964, and Sasano et al., 1962) has shown that the green color that develops in tuna after the fish has been cooked is closely related to the trimethylamine oxide (TMAO) content of the raw meat. The distribution of the green color varies in the cooked fish--it is generally concentrated in the superficial layer near the head and in the body muscles at the tail section of the fish. To aid in the study of the relations between "greening" of tuna flesh and the trimethylamine (TMA) content, a simple and rapid method for the analysis of TMAO was needed. The present paper reports on experiments leading to the development of such a method.

In the procedure for determining TMAO, the TMAO is reduced to TMA. In the reduction method of Bystedt et al. (1959), two hr. is required to reduce TMAO to TMA. The present authors decreased this time to 1 to 1.5 min. by use of heat.

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 Abstracter: F. T. Piskur

7.86 (Cross Ref.: 0.5) THE DETECTION AND ENUMERATION OF CLOSTRIDIUM PERFRINGENS IN FOODS

Hall, W. M., S. J. Witzeman, and R. Janes (General Foods Corporation, Technical Center, White Plains, New York 10602)
Journal of Food Science 34, No. 2, 212-214 (March-April 1969)

During the course of studies to standardize the methods of Angelotti et al. (1962) for detecting Clostridium perfringens, the present authors had difficulty in demonstrating consistent nitrate reduction and sporulation by strains of the organism. To overcome these problems, the authors studied (1) ways of enhancing nitrate reduction and (2) criteria for Cl. perfringens that do not rely on the production of spores.

A method that uses SPS (sulfite-polymyxin sulfadiazine) agar and incorporates an improved lactose egg yolk agar and a modified nitrate motility medium was developed for the enumeration and confirmation of vegetative cells and spores of Cl. perfringens in foods. The method employs several diagnostic criteria (morphology, H_2S production, lecithinase production, lactose fermentation, anaerobiosis, gelatin liquefaction, motility, and nitrate reduction). It can be completed within 48 hr. [1 table, 11 references]

 Abstracter: F. T. Piskur

7.86 (Cross Ref.: 0.5) ACCELERATED PROCEDURE FOR SALMONELLA DETECTION IN DRIED FOODS AND FEEDS INVOLVING ONLY BROTH CULTURES AND SEROLOGICAL REACTIONS

Sperber, W. H., and R. H. Deibel (Department of Bacteriology and The Food Research Institute, The University of Wisconsin, Madison 53706)
Applied Microbiology 17, No. 4, 533-539 (April 1969)

A major problem confronting the food industry today is the long time (4 to 6 days) needed to determine whether a product is free of Salmonella. This paper reports on experiments to develop an accelerated procedure for detection of Salmonella in dried foods and feeds.

A method was developed whereby Salmonella could be detected in dried foods and feeds within 50 hr. The procedure includes preenrichment (18 hr.), selective enrichment (24 hr.), elective enrichment (6 to 8 hr.), and serological testing (2 hr.). The procedure is more rapid than and as sensitive as the traditional procedures. Also, the new procedure is simple and inexpensive to perform. With the new procedure the pure cultures are not isolated, but the isolation step may be performed easily if desired. [5 tables, 9 references]

 Abstracter: F. T. Piskur

7.81

Using their modified method of analysis, the authors determined the distribution of TMAO in the muscles of yellowfin tuna. They recommended that samples of flesh from the interior portion of the dorsal muscles be taken when the tuna is assessed for "greening." [1 figure, 6 tables, 11 references]

7.86 (Cross References: 0.5, 6.55)

COMPARISON OF TWO PROCEDURES FOR DETECTION OF SALMONELLA IN FOOD, FEED, AND PHARMACEUTICAL PRODUCTS

Fantasia, L. D., W. H. Sperber, and R. H. Deibel (Food and Drug Administration, Division of Bacteriology, Brooklyn, New York, and Department of Bacteriology and The Food Research Institute, The University of Wisconsin, Madison 53706)
Applied Microbiology 17, No. 4, 540-541 (April 1969)

A survey of food, feed, and pharmaceutical products was made to compare the rapid enrichment serology (ES) procedure for detection of Salmonella with the traditional procedure, Bacteriological Analytical Manual (BAM). The ES procedure was developed by Sperber and Deibel (1969). The traditional BAM method is described in the BAM (Elliott, 1966). Six hundred and eighty-nine samples representing 227 lots of 35 different products were tested. Excellent agreement was obtained between the two methods. The ES procedure was just as accurate as, but more rapid than, the BAM procedure.
[3 tables, 2 references] [Abstracter: F. T. Piskur]

7.50 (Cross References: 7.51, 7.591)

A PRESSURE JUMP APPARATUS WITH OPTICAL DETECTION

Goldsack, D. E., R. E. Hurst, and J. Love (Fisheries Research Board of Canada, Vancouver Laboratory, Vancouver 8, British Columbia)
Analytical Biochemistry 28, Nos. 1-3, 273-281 (April 4, 1969)

Perturbation techniques are being used to study fundamental biophysical problems such as the transient behavior of enzyme reactions and the isomerization of proteins. Such techniques can be used to study chemical reactions where the time of reaction is from a second to a microsecond. The present authors developed a pressure jump apparatus with optical detection that can be used for studying transient chemical reactions in the time region of 100 μsec. to 5 sec. The pressure jump technique involves the application of a static pressure to an aqueous solution; a sharp drop in pressure is produced by a bursting membrane technique. The system is monitored by following the small changes in conductivity of the solution.

Preliminary results on the kinetics of isomerization of bovine serum albumin at alkaline pH showed two well-separated relaxation times. The slow relaxation time of 100 to 200 msec. was independent of the concentration of protein and dye; it was pH dependent and was attributed to the isomerization of the protein. The fast relaxation time of 2 to 10 msec. was dependent on the concentration of protein and indicator (phenol red), and was associated with the binding of the dye to the protein (the indicator was used as a means of coupling the isomerization to a color change so that the colorless isomerization could be detected). [4 figures, 1 table, 8 references] [Abstracter: F. T. Piskur]

7.86 (Cross Reference: 6.7)

ELIMINATION OF SALMONELLAE FROM ANIMAL GLANDULAR PRODUCTS

De Fiebre, Conrad W., Kenneth T. Burck, and David Feldman (The Wilson Laboratories, Chicago, Illinois 60609)
Applied Microbiology 17, No. 3, 344-346 (March 1969)

Glandular pharmaceutical products generally consist of whole dried and defatted animal glands. Removal of unwanted microorganisms from these products presents a special type of problem. The product, during preparation, is not solubilized. Significant heat may not be applied to the material during the steps when water is present because such treatment reduces the biological value of the product. The present paper reports on studies of methods for the elimination of salmonellae from selected powdered pharmaceuticals of animal glandular origin. The test products were pancreatin (a powder containing proteolytic, amylolytic, and lipolytic enzymes prepared from hog pancreas glands), and stomach substance and thyroid (nonenzyme products).

Terminal heat treatment was effective for pancreatin. Powders of stomach substance and thyroid were treated successfully with acidified organic solvents. Other methods, including microwave heating and radiation treatment, were tried but were not suitable because of reduction in the biological or physical property of the product or of an inability to eliminate the salmonella.
[1 table, 4 references] [Abstracter: F. T. Piskur]

7.86 (Cross Ref.: 8.8) FLUORESCENT-ANTIBODY TECHNIQUE IN DETECTION OF SALMONELLAE IN ANIMAL FEED AND FEED INGREDIENTS

Laramore, C. R., and C. W. Moritz (Microbiology Laboratories, Veterinary Department, Chow Research Division, Ralston Purina Company, St. Louis, Missouri 63199)
Applied Microbiology 17, No. 3, 352-354 (March 1969)

The use of the fluorescent antibody (FA) technique for rapid detection of Salmonella in food products has been proposed. However, some workers have found good correlation between the FA method and the cultural method, whereas others have found the FA method less satisfactory. This paper reports on the examination of the degree of correlation and the reliability of the two methods in the routine analyses of animal feeds, animal byproducts, and animal feed ingredients. The products consisted of fish meal, soybean meal, feather meal, meat meal, complete feeds, and miscellaneous items.

Comparative studies were made on 1,013 samples. The agreement between the two methods was 92.1 percent. False positives found were 5.7 percent; false negatives, 2.2 percent. Fifteen of the 22 false negatives were obtained on meat meal. The authors believe that the FA technique is acceptable, but in some cases the results may require cultural confirmation. [2 tables, 7 references]

8.59 NUCLEOTIDES AND RELATED COMPOUNDS IN CANNED SHRIMP

Rao, S. V. Suryanarayana, J. R. Rangaswamy, and N. L. Lahiry (Central Food Technological Research Institute, Mysore, India)
Journal of the Fisheries Research Board of Canada 26, No. 3, 704-706 (March 1969)

Nucleotides and related compounds have been reported to be associated with the flavor of fish. Hashimoto (1964) showed that adenosine-5'-monophosphate (AMP) was a flavor enhancer in certain fishery products. The purpose of the present study was to determine the effect of canning on the flavor components (nucleotides and related compounds) of shrimp.

The results are summarized as follows:

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7.89 MICRODETERMINATION OF THE DRUG INGREDIENTS, 2-CHLORO-4-NITROBENZAMIDE, 4'-[(p-NITROPHENYL)SULFAMOYL]-ACETANILIDE AND 4-AMINOBENZENEARSONIC ACID IN MEDICATED FINISHED FEEDS

Malaiyandi, Murugan, Sheila A. MacDonald, and J. P. Barrette (Canada Department of Agriculture, Plant Products Division, Central Experimental Farm, Ottawa, Canada)
Journal of Agricultural and Food Chemistry 17, No. 1, 51-55 (January-February 1969)

Aklomide (2-chloro-4-nitrobenzamide), sulfanitran (4'-[(p-nitrophenol)sulfamoyl]acetanilide), and p-arsanilic acid (4-aminobenzenearsonic acid) are used in animal and poultry feeds along with other medicaments. No suitable procedure is available for their determination when they are present as a mixture in medicated finished feeds. By use of a thin-layer alumina chromatoplate, aklomide and sulfanitran are separated from p-arsanilic acid and individually estimated colorimetrically using the Bratton-Marshall reagent. A separate sample of the same feed is digested with alkali and the determination repeated, giving the total of sulfanitran and p-arsanilic acid. The amount of p-arsanilic acid is calculated by difference. Recovery of aklomide and sulfanitran is greater than 96 percent and that of p-arsanilic acid is about 90 percent.
[1 figure, 2 tables, 13 references]

8.6 (Cross Ref.: 8.8) CHEMICAL STUDIES ON COMPONENTS OF DRIED BONITO, "KATSUOBUSHI" PART I - VOLATILE HYDROCARBONS

Sasaki, Shigeru (Research Laboratories, T. Hasegawa Co., Ltd., Nihonbashi, Tokyo, Japan), Soichi Arai, Hiromichi Kato, and Masao Fujimaki (Department of Agricultural Chemistry, The University of Tokyo, Tokyo, Japan)
Agricultural and Biological Chemistry 33, No. 2, 270-275 (February 1969)

"Katsuobushi" is a seasoning product used extensively in Japan. It is prepared by various combinations of treatments of bonito (or other fish such as mackerel and muroaji), including boiling, sun-drying, smoking, and molding. The purpose of the present study was to identify the volatile components of "Katsuobushi" that contribute to its flavor. Gas chromatographic analysis was used; hydrocarbons were identified by the methods of nuclear magnetic resonance and infrared spectrometry.

Nine hydrocarbons were identified: n-tetradecane, n-pentadecane, n-hexadecane, n-heptadecane, n-octadecane, n-nonadecane, n-eicosane, n-heneicosane, and n-docosane. n-Pentadecane and n-heptadecane were the main components. The volatile components of "Katsuobushi" prepared from frigate mackerel, mackerel, and muroaji also contain n-pentadecane and n-heptadecane in large proportion and the other hydrocarbons only in negligible amounts.
[10 figures, 2 tables, 14 references]

7.89 (Cross Reference: 6.54)

DETERMINATION OF ISOPROPYL ALCOHOL IN SOLID FISH PROTEIN CONCENTRATE BY GAS-LIQUID CHROMATOGRAPHY

Smith, Preston, Jr., and Norman L. Brown (Technological Laboratory, Bureau of Commercial Fisheries, U.S. Fish and Wildlife Service, College Park, Maryland 20740)
Journal of Agricultural and Food Chemistry 17, No. 1, 34-37 (January-February 1969)

Isopropyl alcohol is used as the extraction solvent in the laboratory process for making fish protein concentrate (FPC). To maintain quality control of the removal of solvent from the protein concentrate and to insure compliance with existing food standards, it is necessary to measure the amount of isopropyl alcohol in the final product. The purpose of this work, therefore, was to develop a rapid and accurate gas-liquid chromatographic (GLC) method for determining isopropyl alcohol in FPC.

A suitable method was developed. The FPC is heated to 180° C. in a closed tube for 20 min. to release the isopropyl alcohol, and then the alcohol released is injected into the GLC system. The method is also satisfactory for the determination of isopropyl alcohol in other solid food products containing FPC, such as cookies, crackers, and noodles. [1 figure, 2 tables, 16 references]

[Abstracter: F. T. Piskur]

9.12 TAGGING FISH ON THE SEA BOTTOM

Anonymous
Commercial Fishing 8, No. 2, 34-35 (February 1969)

Tagging is essential to scientific studies of fish, since it makes possible a reconstruction of the fish's movements and development. Up to now, tagging has been done on the deck of a ship after the fish were hauled up from the sea; the fish are then thrown back into the ocean. But fish, like humans, are subject to the bends. They can rise from 200-meter depths to a depth of 20 meters without feeling the change; but from 20-meter depths to the surface, they suffer from the change in pressure, and their air bladders rupture.

A Turkish scientist has devised a method of tagging fish without bringing them up through this critical zone. To test the method, he had them hauled in a net alongside a hemispherical cage that had been lowered to the bottom. Once they were tagged, they were caged and left for 6 hours. Upon returning to the bottom, he found that all the marked fish were still alive in their cages. He therefore concluded that underwater tagging is feasible. Although the method is slow and requires precise timing on the part of those who must maneuver the nets and those who must do the tagging on the bottom, development of sophisticated equipment (for example, a clip or stapler that functions automatically on contact with the fish) could enable a diver to mark 500 or more fish an hour.

[Abstracter: L. Baldwin]

7.872 SEMIAUTOMATED THIOCYANATE METHOD FOR DETERMINING PEROXIDE VALUES OF LIPIDS

Starkovich, J. A., and W. T. Roubal (Food Science Pioneer Research Laboratory, Bureau of Commercial Fisheries, U.S. Fish and Wildlife Service, Seattle, Washington 98102)
Journal of Food Science 34, No. 2, 194-195 (March-April 1969)

Rancidity of extracted oils is measured by the thiobarbituric acid TBA) test or a peroxide test. Both tests may be adapted to semimicro analyses, but they are not amenable to automation and are unsuitable for making a large number of multiple analyses. The purpose of the present study was to devise a sensitive, semiautomated procedure for determining peroxide values of fish oils and for measuring low levels of pure hydroperoxides.

A liquid-flow semiautomated version, with numerous modifications, of the ferrous thiocyanate procedure of Wagner et al. (1947) was developed. The system uses conventional manifold tubing and AutoAnalyzer components. It permits analysis of 20 samples per hour. Generally, a 0.05-ml. sample is used for each test, but smaller amounts may be used with oils of high peroxide value. Larger samples of esters and other oil derivatives readily soluble in chloroform-propanol solution can be used to enhance the sensitivity. [3 figures, 4 references]

[Abstracter: F. T. Piskur]

8.59 (Cross Reference: 3.3343)

Compound	Amount of compound in:			
	Fresh shrimp	Shrimp canned in laboratory	Shrimp canned commercially	
			Avg.	Range
	µm./g.	µm./g.	µm./g.	µm./g.
AMP	1.40	0.47	0.23 [2]	0.16-0.36
IMP [1]	2.75	1.10	0.37 [2]	0.22-0.65
Inosine	1.30	0.53	0.40 [3]	0.10-1.00
Adenosine	0	0	0.15 [3]	0.08-0.21
Hypoxanthine	2.09	0.53	0.24 [3]	0.12-0.43

[1] IMP = inosine-5'-monophosphate.
[2] Three samples.
[3] Four samples.

Apparently a significant reduction in the level of the flavor components, nucleotides and related compounds, occurs in the canning of shrimp. [1 table, 9 references]

8.8 MICROFLORA OF FRESH AND STORED FLATFISH, KAREIUS BICOLORATUS

Simidu, Usio, Emiko Kaneko, and Kazuyoshi Aiso (The Institute of Food Microbiology, Chiba University, Izumi-cho, Narashino-shi, Chiba-ken, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 35, No. 1, 77-82 (January 1969)

In 1968, Simidu et al. and Aiso et al. showed that Vibrio is the predominant organism associated with the inshore fish of Japan. In the present work, the authors undertook to determine the changes in these bacterial flora during storage of flat fish at 2° C., the composition of the isolates from the fresh and frozen fish, and the growth of the isolates on skin and gill and in gut and muscle at different temperatures.

At the beginning of storage, the number of bacteria that would grow at 2° C. was much lower than the number that grew at 20° C.; however, after 7 days' storage, the viable counts at 2° C. equaled the counts at 20° C. The viable counts in muscle after 7 and 14 days' storage were relatively low, despite the fact that the appearance and odor of the fish gave clear signs of spoilage. At 30° C., bacteria grew at a much higher rate on the skin than on the gills and in the guts. Strangely, an appreciable number of the Vibrio and Aeromonas isolated from the gills, guts, and muscles of the stored fish failed to grow at 20° C.; the optimum growth temperature for these strains was about 15° C.

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9.125 AGE AND RACIAL STUDIES OF JAPANESE JACK MACKEREL-- I. AGE AND GROWTH AS DETERMINED BY UROHYAL

Kim, Wan Soo (Department of Oceanography, College of Liberal Arts and Science, Seoul National University, Republic of Korea), and Yoshio Hiyama and Yukio Nose (Department of Fisheries, Faculty of Agriculture, University of Tokyo, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 35, No. 2, 178-186 (February 1969)

Since 1938, when Aikawa and Kato first investigated a method for determining age in Japanese jack mackerel (Trachurus japonicus, Temminck et Schlegel), several investigators have looked into methods of determining the jack mackerel's age. Murakami and Shindo (in 1949), Mita (in 1957), and Mitani and Ida (in 1964) worked on scales; Mibuchi et al. (in 1958) and Azeta and Ochiai (in 1962) worked on otoliths. The results are inconsistent and ambiguous, however, so the present authors offer a method that they believe will clear up some of the ambiguity.

Using 66 random samples consisting of 4,008 fish taken from the east, south, and west coasts of Japan between June 1964 and October 1965, they removed the mackerels' urohyals and cleaned them of any adhering muscle. The urohyal of the jack mackerel is irregularly bow shaped and noticeably compressed laterally. Its large postventral lobe is distinctly bow shaped and has many growth zones; the ventral lobe also shows growth zones, but they are usually not clearly visible. Its small antedorsal lobe also shows growth zones, manifested by alternating narrow hyaline and wide opaque zones. This latter surface is the one used for

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9.1 ECOLOGY OF THE DEEP-SEA BENTHOS

Sanders, Howard L. (Woods Hole Oceanographic Institution, Woods Hole, Massachusetts), and Robert R. Hessler (University of California, San Diego Campus, La Jolla)
Science 163, No. 3874, 1419-1424 (March 28, 1969)

Approximately 94 percent of the ocean bottom lies below the permanent thermocline. This region is remarkably stable and homogeneous in its physical and chemical characteristics. The area is constantly dark, and the bottom water is of constant salinity, oxygen content, and low temperatures. Little information is available on the kinds of animals living in this deep-sea environment and about the relation of the environment to the ecology and physiology of the deep-sea fauna. To obtain such information, the authors made a study during the period from 1960 to 1966 of a transect of the ocean floor between southern New England and Bermuda. They developed and used the Anchor Dredge for quantitatively sampling the infauna (animals living in the bottom), and the Epibenthic Sled to collect epifauna (animals living on the bottom) and infauna in large quantities.

The benthos of the deep-sea region showed low density but high within-habitat diversity. The composition of the benthic fauna gradually and continuously changes with depth throughout the bathyl and abyssal regions, but an abrupt faunal discontinuity appears at the shelf-slope break in from 100 to 300 meters of water. The fauna shallower than the zone of discontinuity is eurytopic and of

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9.13 NEUROCHEMICAL OBSERVATIONS ON SPAWNING PACIFIC SALMON

Trams, Eberhard G. (Laboratory of Neurochemistry, National Institute of Neurological Diseases and Stroke, National Institutes of Health, Bethesda, Maryland 20014)
Nature 222, No. 5192, 492-493 (May 3, 1969)

Pacific salmon (Oncorhynchus spp.), unlike other Salmonidae, invariably die upon spawning. Death is preceded by various metabolic changes, which are manifested by such pathological evidence as infections, loss of weight, Cushing's syndrome, and renal and hepatic failure. Inasmuch as the steady state of the brain often appears to be undisturbed during metabolic changes, the changes in brain enzyme levels of 50 pink salmon (O. gorbuscha) collected between August 27 and September 27, 1968, from both a salt-water environment and the fresh-water spawning grounds were observed. The observations may show that organic failure starts during the upstream migration.

After the fish's spinal cords were severed, tissues were removed and processed immediately. Brain cholinesterase was estimated in whole homogenates with acetylthiocholine as a substrate (Guth et al., 1964). Cholinesterase of the pituitary declined significantly during the spawning run; that of the other parts of the brain also showed a downward trend, if any. Catechol-o-methyltransferase was determined by the method of Axelrod et al. (1965), with S-adenosylmethionine (methyl-^{14}C) as the methyl donor, and catecholamine content was determined fluorometrically (Anton et al., 1962). During the spawning run, the pituitary content

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low diversity, and is taxonomically distinct from the stenotopic, highly diverse population living below the discontinuity.
[3 figures, 3 tables, 41 references]

9.13 FACTORS INVOLVED IN CYCLIC PROTEIN SYNTHESIS IN SEA URCHIN CELLS DURING EARLY EMBROGENESIS[SIC]

Mano, Yoshitake (Department of Biochemistry, Faculty of Medicine, University of Tokyo, Bunkyo-ku, Tokyo, Japan)
Journal of Biochemistry 65, No. 3, 483-487 (March 1969)

In 1968, the author reported that protein synthesis in sea urchin cells during early embryogenesis proceeds in a cyclic manner with an increasing metabolic rate. The cyclic synthesis of protein was also observed in a cell-free supernatant of fertilized sea urchin eggs, but there was no increase in the basal rate of synthesis. In the present paper, the author reports that at least three cytoplasmic factors are involved in the cyclic process of protein synthesis in the cell-free system; one factor involves a protetnous SH group that seems to act as a pacemaker for the cyclic phenomenon. [5 figures, 17 references]

[Abstracter: F. T. Piskur]

9.3 UPDATE OF FOOD ADDITIVE LEGISLATION

Martin, C. R. A.
Food Manufacture 44, No. 4, 38-40 (April 1969)

The rapid advances in food technology, especially in the introduction of new food substances and adjuvants, dictate that the statutory controls applicable to food additives be kept under constant review. Among the additives covered in this article are preservatives, antioxidants, emulsifiers, stabilizers, flavorings, solvents, and improving agents. The required labels specifying their presence are also covered. [3 references]

[Abstracter: L. Baldwin]

8.8 (Cross References: 3.2494, 7.86)

The composition of the bacterial flora found on the flatfish, both the fresh fish and the fish stored at 2° C., differed according to the part of the fish upon which the organisms occurred. The dominant organisms on the skin were Pseudomonas and Achromobacter; on the gills and in the gut and muscle, the Vibrio-Aeromonas group predominated. (The authors had difficulty in discriminating Aeromonas from Vibrio.) [4 tables, 12 references]

9.125 (Cross Reference: 1.11)

the age investigation. In reading the urohyal, the hyaline zones are counted. The readability was 81.4 percent for the east coast samples and 82.9 percent for the west coast samples.

Growth of the fish was investigated by application of the back calculation method, which requires accurate knowledge of the relation between urohyal height and fish length. These data were analyzed by the method of least squares and an equation for the regression of body length (BL) on urohyal height (R) was derived: BL = 0.3±50.97R. The average of each hyaline zone was then referred to the regression equation, and the mean sizes of the fish at the time of hyaline zone formation were obtained. Urohyal measurements and length-frequency analyses showed that the rate of growth of jack mackerel is fairly rapid.

Examination of the hyaline and opaque zones at monthly intervals revealed that the urohyal is formed during December and January and during July and August. Urohyals from fish collected from November to February showed hyaline margins, whereas those from fish collected from March to June showed opaque margins. The authors assume, therefore, that two hyaline zones are formed annually, one in the winter and one in the summer, and represent 6 months' growth. Although many anomalies appeared, the zone formed in winter seemed to be wide and well defined, and the zone formed during the summer seemed to be narrow and sharp.

As part of the age investigation, the monthly variations in gonad weight and ovum diameter were analyzed. The analysis showed that the spawning season extends from January to July, the peak activity varying with the year and the region from which the fish were taken. Growth curves, as an indication of age, were almost identical through age 1 (the difference in mean lengths being 13 mm.), reasonably similar through age 2 (the difference in mean lengths being 24 mm.), but quite different at age 3 (the difference in mean lengths being about 30 mm.).
[9 figures, 4 tables, 10 references]

9.15 STUDIES ON PATHOGENIC PROPERTIES OF AEROMONAS LIQUEFACIENS--I. PRODUCTION OF TOXIC SUBSTANCE TO EEL

Shimizu, Tomoko (Dept. of Fisheries, Fac. of Agriculture, Univ. of Tokyo, Bunkyo-ku, Tokyo, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 35, No. 1, 55-63 (January 1969)

Although most of the motile members of Aeromonas are pathogenic to freshwater fishes, Sniezsko and Bullock in 1962 suggested that only the strain that is motile and pathogenic to fish should be identified with A. liquefaciens. The present author accepts this identification. In spite of the mass of knowledge about the hemorrhagic septicemia caused by the bacterium, little is known about the mechanism of its pathogenic effects or about the toxic substance and its biochemical and pathogenic properties. Therefore the author undertook to confirm that Aeromonas will produce a substance toxic to eels and other animals and that the symptoms typical of hemorrhagic septicemia can be caused by it.

Eels, guinea pigs, and mice were inoculated with viable cells from an infected eel and with a cell-free preparation of Aeromonas. Both types of inoculum generated a toxic substance that produced in all the test animals symptoms typical of the Aeromonas disease in eels. Moreover, the symptoms appeared very

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 Abstracter: L. Baldwin

9.16 BREEDING CARP FOR REDUCED NUMBER OF INTERMUSCULAR BONES AND GROWTH OF CARP IN AQUARIA

Meske, Ch. (Max-Planck-Institut für Kulturpflanzenzüchtung, 2000 Hamburg-Volksdorf, Germany)
Bamidgeh 20, No. 4, 105-119 (December 1968)

This report was given at the Fish Culture Research Station, Dor, Israel, on April 26, 1968. It covers work done in Germany on breeding carp without intermuscular bones (since other species, such as cod, do not have intermuscular bones, the laws of parallel mutations and variations would indicate this goal is attainable), breeding fast-growing, quality carp strains in limited space under various feeding and nutritional conditions; breeding carp that will attain sexual maturity and propagate under laboratory conditions; and obtaining artificial spawn by means of hypophysation. Presently the group is working on methods of preserving the sexual products.

Among the findings reported are the following: (1) A television camera that reacts to X-rays (a byproduct of U.S. space research) has the capacity to show fine intermuscular bones. When it is connected to a television set, fish can be examined directly on the screen while they are lying under the X-ray tube. (2) Space does not influence the growth of carp if the quantity of water flowing through the aquarium is adequate and continuous. (3) However, the frequency of feeding and the content of protein in the food (manufactured trout food was used

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 Abstracter: L. Baldwin

9.16 MUSSEL RAFT TRIALS SUCCEED IN SCOTLAND

Mason, James
World Fishing 18, No. 4, 22-24 (April 1969)

In the 19th century, the mussel, which is common all along the Scottish coast, supported a thriving fishery. Now, however, the 400-500 tons that are gathered annually go almost exclusively for bait. Often the mussels are of very poor quality because of overcrowding, long exposure between tides, the silty water, or other unfavorable conditions. They usually have rounded edges and a blue-black shell, both indications of slow growth, rather than the brown, sharp-edged shells and plump flesh of fast-growing mussels. Since the shellfish adapts well to cultivation, experiments have been conducted to determine whether, by suitable methods, a good-quality mussel capable of satisfying a part of the British consumers' demand could be produced in Scotland.

Of the various methods of cultivating mussels, cultivation on ropes suspended in the sea seemed to be the best. This method has been used for years along the Mediterranean coast, and recently it has been established as the basis of a flourishing industry along the coast of Northern Spain. There, large rafts with some 800 ropes hanging from each are floated in the estuaries. The mussel spat settle on the ropes in the spring and grow rapidly, being ready for market by the following spring. Sticks pushed through the lay of the ropes prevent them from sliding off. This method of cultivation has several advantages: it is simple; the phytoplankton on which the mussels feed is available at all depths, not

(over)

 Abstracter: L. Baldwin

9.2 HOW AMERICA "EXPORTS" A FISHING INDUSTRY

Chapman, W. M.
World Fishing 18, No. 2, 37-38 (February 1969)

The production of fish and shellfish by U.S. flag ships has not increased over the past several decades; nor has the per capita consumption of fish and shellfish increased in the United States. The 2,100,000 short tons produced in 1967 was less than that in 1934; and the 10.6 lb. consumed by each person in 1967 was 0.4 lb. less than that consumed in 1916. Yet the total use of all types of fishery products in the United States, both absolute and relative to that in the rest of the world, has increased steadily. The difference lies in the increase in imports, which have risen from 20 percent in 1948 to 71.4 percent in 1967; 1968 statistics indicate they are still rising. This rapid growth has not been as much a matter of foreign fish firms' building markets in the United States as of U.S. firms' building markets and then reaching out to foreign suppliers for raw material with which to supply them.

Most of the market growth has been in four classes of product: fish meal and solubles, which are used for animal feeds; frozen shrimp, lobster, crab, and other crustacea, which are used for direct human consumption; tuna, which is canned; and frozen ground fish, which are made into such products as steaks, sticks, portions, and sandwiches for human consumption. The author discusses each of these four products, giving the amount of increase and the factors and U.S. firms accountable for it.

(over)

 Abstracter: L. Baldwin

9.16 (Cross Reference: 1.88)

just on the bottom; predators and parasites--for example, starfish, crabs, and Mytilicola--that attack shellfish on the sea bed cannot reach them; bombardment by silt, which stunts the mussels' growth, is less likely; and the mussels are covered by water at all times, not just when the tide is in.

Preliminary experiments in Loch Tournaig, off Loch Ewe, resulted in marketable-sized mussels within 2 years of the spat's being tied to the ropes. The flesh of these mussels was good, attaining a condition factor (wet meat volume/total internal shell cavity volume) of 50 percent (40 percent is acceptable). Therefore the main experiments were begun. Linne Mhuirich, a shallow, sheltered inlet on the west coast was the site chosen. There the tidal range is only 2 or 3 3 ft.; summer temperatures are relatively high, reaching 20° C. in June; salinity ranges from 30°/$_{oo}$ to 32°/$_{oo}$ and never falls below 25°/$_{oo}$; the risk of pollution is nonexistent; and the production of phytoplankton promises to be high. Coir, a rope with appreciable nap was used to hold the spat.

The mussels in Linne Mhuirich grew even better than those in Loch Tournaig, all being marketable 14 months after the spat had settled. This rate of growth is far better than any recorded for naturally occurring mussels in Britain. Moreover, the mussels had all the good qualities associated with quick growth. The author concludes that the method is well suited to the west coast of Scotland, that the mussels raised are eminently suitable for the human market, and that other of Scotland's west coast inlets are suitable for application of the method. [9 figures]

9.2 (Cross Reference: 0.6)

The use of fish meal and fish solubles, which account for 65 percent of the total supply of fishery products used in the United States, increased from 1.8 billion pounds in 1948 to 9.1 billion pounds in 1967. The increase has come chiefly from imports, over 75 percent from Peru and Chile. More than a third of the Peruvian catch was processed into meal (well over 3,500,000 tons) by U.S.-owned firms.

Frozen crustacea constitute the domestic fishermen's single most valuable source of income, being worth $100,000,000 to them in 1967. However, the main supply comes from imports, which rose from less than 15 percent of the total market in 1948 to 51 percent in 1967. To supply this growing market, a wide variety of U.S. firms has engaged in operations of almost every kind throughout the world--furnishing advice, managerial skills, and credit assistance; entering into joint ventures with local firms; establishing U.S.-owned processing, freezing, and storage plants; operating and manning U.S.-owned catching fleets and their support vessels.

The experience of tuna firms in foreign fishing affairs, though older than that of the crustacea processors and marketers, is very similar. The canned weight of tuna sold in the United States has increased from 140,000,000 lb. in 1948 to 454,000,000 lb. in 1967.

The U.S. market for products made from frozen groundfish has risen from about 425,000 short tons (round weight) in 1948 to 950,000 tons in 1967. Although Canadian, Norwegian, and Icelandic firms have established direct sales outlets in the United States, U.S. firms have established subsidiary branches or have entered into joint ventures in Europe, South America, and Africa.

9.15

soon after the inoculations were given. The results, however, do not definitely establish whether the origin of the toxic substance is intracellular or extracellular. [4 figures, 3 tables, 14 references]

[Abstracter: F. T. Piskur

This paper describes two modified staining procedures for use in oyster pathology studies. One method uses a cresyl-fast violet stain for differentiating bacteria and fungi from tissue components in oysters. The other method uses a trichrome stain for collagen and bacteria in oyster tissue sections. These two staining methods should be useful to oyster pathologists as aids in quickly identifying certain pathogens and cell types that cannot be readily detected with routinely used hematoxylin and eosin stains. [6 references]

9.15 TWO MODIFIED STAINS FOR USE IN OYSTER PATHOLOGY

Heaton, Leroy H., and Gilbert B. Pauley (Comparative Pathology Section, Biology Department, Battelle Memorial Institute, Pacific Northwest Laboratory, Richland, Washington 99352)
Journal of the Fisheries Research Board of Canada 26, No. 3, 707-709 (March 1969)

9.16

almost exclusively) will affect growth rate. (Fish that could only feed at night grew better than those that fed intermittently for 24 hours.) (4) Two-year-old carp (following hypophysation) will produce viable spawn at any time of the year, an individual carp being able to spawn at least every 5 months.

The ability to obtain artificial spawn by means of hypophysation opens a variety of possibilities for breeding work. However, the preservation of the spawn and the milt is necessary; hence the present investigations. Since fish eggs are fertilized outside the fish's body, the possibility of preserving unfertilized eggs would be extremely valuable to fish breeders. The establishment of sperm and egg banks to supply breeding material is certainly within the realm of possibility. All this, coupled with the possibility of the biological utilization of the heating energy released into the cooling water from big power plants, promise fundamental and profitable changes in the field of fish breeding. [18 figures, 11 references]

9.14 (Cross Reference: 4.91)

CHANGES IN THE LIPID COMPOSITION OF RAINBOW TROUT (SALMO GAIRDNERII) FED CYCLOPROPENOID FATTY ACIDS

Roehm, Jeffrey Noyes (Oregon State Univ., Corvallis)
Chemical Abstracts 70, No. 3, 18013m (February 3, 1969)

0.5 MEMBRANE FILTER-FLUORESCENT-ANTIBODY METHOD FOR DETECTION AND ENUMERATION OF BACTERIA IN WATER

Guthrie, Rufus K., and Dennis J. Reeder (Department of Biology, North Texas State University, Denton, Texas 78213)
Applied Microbiology 17, No. 3, 399-401 (March 1969)

Rapid methods for determining specific contaminating organisms in water would be beneficial in the evaluation of water supplies for public health purposes. The present authors describe a technique that employs nonfluorescing membrane filters and specific fluoresceinisothiocynate-labeled antiserum; it has been used successfully for identifying and enumerating known species of Escherichia coli that were added to natural populations of bacteria in water. The results of the quantitative analyses compared favorably with those obtained by standard tests. The method may be useful for monitoring specific bacterial types collected from waters being checked for specific pollution.
[1 figure, 1 table, 8 references] [Abstracter: F. T. Piskur]

[1 table, 141 references] (In Japanese) (February 1969)
Bulletin of the Japanese Society of Scientific Fisheries 35, No. 2, 232-243
University, Hakodate, Japan)
Oishi, Keiichi (Laboratory of Seafood Chemistry, Faculty of Fisheries, Hokkaido

SAVOR OF THE SEAFOOD

0.6 (Cross References: 3.336, 8.8)

1.9 (Cross References: 2.12, 9.11)

ZOOPLANKTON VOLUMES OFF THE PACIFIC COAST, 1960

Thrailkill, James R. (Fishery-Oceanography Center, Bureau of Commercial Fisheries, U.S. Fish and Wildlife Service, La Jolla, California 92307)
U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 581, 50 pp. (March 1969) (U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington, D.C. 20240)

Basic data on volumes of zooplankton are given, together with data for all plankton hauls taken on survey cruises of the California Cooperative Oceanic Fisheries Investigations. Distribution charts showing relative areal zooplankton abundance by month are included.

The Bureau uses the plankton samples primarily for studies of the early life history, distribution, abundance, and survival of commercially important or potentially important fishes. These collections are also used by the Scripps Institution of Oceanography in studies of productivity and zoogeography.
[13 figures, 5 tables, 12 references] [From Author's introduction]

0.6 MICROWAVES--NOVEL APPLICATIONS SPUR MARKET APPEAL

Anonymous
Chemical and Engineering News 47, No. 14, 20-21 (March 31, 1969)

Although microwaves are an expensive source of B.t.u.'s, the advantages of using microwave energy for food processing make direct cost comparisons misleading. Besides such advantages as more precise control of heat, more efficient use of heating energy, and more economical use of plant space, there are such advantages as the ability to destroy bacteria and inhibit the growth of microorganisms, which extends shelf life; cook at a temperature low enough to avoid browning and hardening of the product, since microwaves pass through matter to produce a volume heating effect; and cook at speeds some six times faster than the speeds required by conventional cooking methods. (An Arkansas food company by using a combination of microwave energy and steam now cooks 20,000 lb. of chicken parts during an 8-hr. shift.)

The Federal Communications Commission has set aside four microwave frequencies--915, 2450, 5800, and 22,125 megahertz--for industrial, scientific, and medical use. Efficient tubes are available for the first two frequencies.
[2 figures] [Abstracter: L. Baldwin]

2.9 PARALYTIC SHELLFISH POISONING IN BRITISH COLUMBIA

Quayle, D. B. (Fisheries Research Board of Canada, Biological Station, Nanaimo, British Columbia)
Fisheries Research Board of Canada Bulletin 168, 68 pp. (1969) (Queen's Printer and Controller of Stationery, Ottawa, Canada) Price $2.50

Illness from the consumption of shellfish may be brought about by three causes: pollution, allergy, and paralytic shellfish poison. This bulletin reports information on paralytic shellfish poisoning in British Columbia. Assay procedures and the chemistry of the poison are discussed briefly. A historical review of the major outbreaks in British Columbia from 1793 to 1967 is given. The relation between the occurrence of poison in shellfish and the causative organisms is examined, and means of detoxifying shellfish are discussed. Establishment and administration of control measures in British Columbia are reviewed. [12 figures, 24 tables, 50 references] [Abstracter: F. T. Piskur]

Nakamura, Kunisuke, Senji Ishikawa, Katsuo Shudo, and Kunitsugu Katabayashi (Tokai-
Ku Fish. Res. Inst., Tokai, Japan)
Chemical Abstracts 70, No. 3, 18988h (February 3, 1969)

DISCOLORATION OF DRIED MARINE PRODUCTS
AND ITS PREVENTION

3.12 (Cross References: 3.7, 4.64)

0.8 QUANTITATIVE DATA MADE MORE ACCESSIBLE

Anonymous
Chemical and Engineering News 47, No. 17, 64 (April 21, 1969)

National Standard Reference Data System is now providing the U.S. technical community with physical science quantitative data that have been critically evaluated and compiled. Scientists and engineers can quickly obtain the data through mechanized acquisition and handling procedures. The program areas covered are nuclear properties, atomic and molecular properties, solid-state properties, thermodynamic and transport properties, chemical kinetics, colloid and surface properties, and mechanical properties of materials. The four major services provided are the data file, compilation publication services, the inquiry service, and analysis and user relations.

Requests for information should be made to the Office of Standard Reference Data, National Bureau of Standards, Washington, D.C. 20234.
[Abstracter: L. Baldwin]

0.8 (Cross Reference: 8.4)
CHEMICALS FROM SEA WATER
McIlhenny, William F. (Dow Chem. Co., Freeport, Texas)
Chemical Abstracts 70, No. 10, 40537g (March 10, 1969)

0.5 ISOLATION AND PRELIMINARY CHARACTERIZATION OF SOME AEROMONAS SALMONICIDA BACTERIOPHAGES

Paterson, W. D., R. J. Douglas, I. Grinyer, and L. A. McDermott (Department of Microbiology, Ontario Agricultural College, University of Guelph, Guelph, Ontario, Canada)
Journal of the Fisheries Research Board of Canada 26, No. 3, 629-632 (March 1969)

This paper describes some of the properties of bacteriophages for Aeromonas salmonicida (causative agent for the disease furunculosis) that were isolated from trout hatcheries and ponds in southern Ontario. Thirteen bacteriophages were isolated; they formed three serological groups and two distinct morphological types. [4 figures, 2 tables, 11 references] [Abstracter: F. T. Piskur]

0.5 STUDIES ON THE MARINE BACTERIA UTILIZING INORGANIC NITROGEN COMPOUNDS--III. ON THE BACTERIAL ACTIVITIES IN BOTTOM MUDS

Kimata, Masao, and Yoichi Yoshida (Dept. Fish., Fac. Agr., Kyoto Univ., Maizuru, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 35, No. 2, 215-217 (February 1969) (In Japanese; figures, tables, and summary in English)

The activities of ammonification and nitrification of bacteria collected from the bottom mud of Maizuru Bay were comparatively high (0.2-4.0 μg. at. N/50 g./4 hr.), although the activities of nitrate reduction and of nitrate assimilation were comparatively low (0-1 μg. at. N/50 g./4 hr.).
[1 figure, 2 tables, 11 references] [Abstracter: L. Baldwin]

4.19 (Cross References: 4.2, 4.3)

BIOCHEMISTRY OF SHELLFISH LIPIDS.
X - ISOLATION OF A SPHINGOLIPID CONTAINING 2-MONOMETHYLAMINOETHYLPHOSPHONIC ACID FROM SHELLFISH

Hori, Taro, Mutsumi Sugita, and Osamu Itasaka (The Department of Chemistry, Faculty of Education, Shiga University, Otsu, Shiga, Japan)
Journal of Biochemistry 65, No. 3, 451-457 (March 1969)

A new sphingophosphonolipid (ceramide 2-monomethylaminoethylphosphonate) was isolated from the mollusk Monodonta labio. The lipid is completely hydrolyzed by Clostridium perfringens phospholipase C in the presence of diethyl ether. 2-Monomethylaminoethylphosphonic acid and ceramide were isolated from the hydrolyzate. [7 figures, 1 table, 18 references] [Abstracter: F. T. Piskur]

4.89 INHIBITING TOBACCO BUD GROWTH AFTER TOPPING
Mounat, Andre (Inst. Exp. Tabac, Bergerac, France)
Chemical Abstracts 70, No. 3, 19080t (February 3, 1969)

4.272 THE CHARACTERIZATION AND INCORPORATION OF RADIOACTIVE BASES INTO SCALLOP PHOSPHOLIPIDS
Shieh, H. S. (Halifax Lab., Fish. Res. Board Canada, Halifax, Nova Scotia)
Chemical Abstracts 70, No. 3, 17874f (February 3, 1969)

1.12 THE JAPENESE ATLANTIC LONGLINE FISHERY, 1965, AND THE STATUS OF THE YELLOWFIN TUNA AND ALBACORE STOCKS

Wise, John P., and William W. Fox, Jr. (U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Tropical Atlantic Biological Laboratory, Miami, Florida 33149)
U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 582, 7 pp. (April 1969) (U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington, D.C. 20240)

Fishing effort reached nearly 100 million hooks in 1965, a level which is more than the yellowfin tuna stocks can support and remain commercially productive. As catch rates for yellowfin tuna decrease, more and more fishing will be directed toward albacore. [2 figures, 7 tables, 15 references]
[Authors' abstract]

1.953 EVIDENCE FOR A SOUTHERN BREEDING POPULATION OF TRUE'S BEAKED WHALE
Ross, G. J. B. (Port Elizabeth Museum, Port Elizabeth, South Africa)
Nature 222, No. 5193, 585 (May 10, 1969)

Up to now, True's beaked whale (Mesoplodon mitus True) has been considered a North Atlantic species. The discovery of three stranded whales--a pregnant female, a calf, and an adult male--on the coast of South Africa within the past decade indicates a southern, though possibly small, breeding population. The 200-mile radius of the strandings and the absence of strandings elsewhere in the Southern Hemisphere point to a localized distribution of the whale population.
[Abstracter: L. Baldwin]

6.15 SISTEMA DE RECUPERACION DE AGUA DE COLA MEDIANTE EVAPORADORES DE LLAMA SUMERGIDA [A SYSTEM FOR RECOVERING STICKWATER BY MEANS OF SUBMERGED FLAME EVAPORATORS]

Molteno, Christopher, James Steel, and Hilarión Gómez
Publnes Inst. Fom. pesq. Santiago, Publicacion No. 43, 29 pp. (1969) (In Spanish; English summary)

Loss of stickwater is one of the main causes of poor yields of fish meal. A few plants in Chile recover all the stickwater, maintaining overall yields of meal of 20 percent or better from the raw material. Plants that either do not have or do not use evaporators get yields of some 5 percent lower than plants that do; thus they waste about 25 percent of their fish.

The Instituto de Fomento Pesquero studied the possibilities of plants' using submerged flame evaporators rather than the conventional tubular equipment. The submerged flame evaporators are, generally speaking, simpler to operate and less expensive to install, and they do not usually require additional boiler capacity for operation. They are, therefore, more likely to be desirable for small or medium-sized fishmeal plants. According to the results of chick feeding tests, the nutritional value of the fish solubles produced by submerged flame evaporators did not differ significantly from that produced by conventional pressure/vacuum evaporators. [5 figures, 9 tables, 4 references]

[Abstracter: L. Baldwin]

7.598 (Cross Reference: 7.773)

EXTRACTION OF FREE FATTY ACIDS FROM PLASMA OR SERUM IN A CONTINUOUS-FLOW SYSTEM

Lorch, E. (Department of Experimental Medicine, F. Hoffmann-La Roche & Co., Ltd., Basel, Switzerland)
Analytical Biochemistry 28, Nos. 1-3, 307-312 (April 4, 1969)

The apparatus commonly used for liquid-liquid extraction in a continuous-flow system fail as soon as a precipitate is formed, for example, in the extraction of free fatty acids from blood plasma or from serum with isopropanol/heptane/sulfuric acid. In order to circumvent this difficulty, the author developed a new device that pumps the plasma into glass cups containing the extraction solvent (the solvent is continuously stirred). The cups are located in the turntable of a second sampler working synchronously with the first sampler from which the plasma specimens are being aspirated. Additional heptane and an acidic sodium sulfate solution are added to speed up the phase separation. The upper heptane phase is washed and fed into the automated colorimetric analysis system described previously (Lorch and Gey, 1966). [4 figures, 4 references]

[Abstracter: F. T. Piskur]

7.49 (Cross Reference: 7.599)

ENZYMIC ASSAY METHOD FOR INORGANIC PYROPHOSPHATE

Reeves, Richard E., and Lamar K. Malin (Department of Biochemistry, Louisiana State University School of Medicine, New Orleans 70112)
Analytical Biochemistry 28, Nos. 1-3, 282-287 (April 4, 1969)

A specific method was developed for the assay of inorganic pyrophosphate. The method couples the enzyme, purivate-phosphate dikinase, with lactate dehydrogenase to form a system that catalyzes the oxidation of NADH (reduced nicotinamide-adenine dinucleotide) equivalent to the added pyrophosphate. The method is sensitive to nanomole quantities of inorganic phosphate, and amounts in the range of 10^{-7} to 10^{-8} mole may be assayed with a precision of 1 to 2 percent. The method does not involve the determination of orthophosphate, and assays may be made in the presence of large amounts of the substance. It is suitable for assays of pyrophosphate in the presence of acid-labile phosphate esters. [2 tables, 6 references]

[Abstracter: F. T. Piskur]

6.193 UNKNOWN GROWTH FACTOR(S), PROTEIN AND FAT DIGESTIBILITY, AND METABOLIZABLE ENERGY EVALUATIONS OF FISH SOLUBLES IN DIETS OF YOUNG TURKEYS

Chu, Aubrey B. (Virginia Polytech. Inst., Blacksburg, Virginia)
Chemical Abstracts 70, No. 3, 17995w (February 3, 1969)

8.59 D-LACTATE SPECIFIC PYRIDINE NUCLEOTIDE LACTATE DEHYDROGENASE IN ANIMALS

Long, George L., and Nathan O. Kaplan (Graduate Department of Biochemistry, Brandeis University, Waltham, Massachusetts 02154)
Science 162, No. 3854, 685-686 (November 8, 1968)

Extracts of a number of different invertebrates were assayed for lactate dehydrogenase stereospecificity. No animal possessed both D-lactate dehydrogenase and L-lactate dehydrogenase, though all contained one or the other. The enzyme from the heart and the muscle of horseshoe crab (Limulus polyphemus), contrary to previous assumptions, was D-lactate specific and not L-lactate specific. It had a molecular weight of 65,000. The gastropod, the polychaete, and all the arachnids studied contained D-lactate enzymes, the molecular weights of which were close to that of the purified enzyme from crab muscle. In contrast, the L-lactate enzymes found in shrimp (Penaeus seriferus), lobster (Homarus americanus), insects, and various other mandibulates had molecular weights roughly the same size as those of the lactate dehydrogenases from vertebrates. The authors suggest that the discovery of the D-lactate enzyme in invertebrates may be a useful parameter for the phylogenetic and taxonomic evaluation of invertebrates. [2 figures, 1 table, 10 references]

[Abstracter: L. Baldwin]

7.524 ACCELERATED CHROMATOGRAPHIC ANALYSIS OF SELENOCYSTINE AND SELENOMETHIONINE

Benson, James V., Jr., and James A. Patterson (Beckman Instruments, Inc., Spinco Division, 1117 California Avenue, Palo Alto, California 94304)
Analytical Biochemistry 29, No. 1, 130-135 (April 11, 1969)

Because selenium and organic selenium derivatives are important in biochemical reactions, a rapid method for quantitative analyses of selenoamino acids is essential. This report describes a chromatographic procedure for the rapid analysis of selenocystine and selenomethionine using a spherical, highly cross-linked cation-exchange resin, Type PA-35 (currently used for chromatography of amino acids and peptides). The chromatographic separation was performed in 45 min. for selenocystine and in 90 min. for selenomethionine on the spherical resin using one buffer, one temperature, and one buffer flow rate.
[2 figures, 1 table, 13 references] [Abstracter: F. T. Piskur]

8.59 (Cross Reference: 0.5)

ANTIFUNGAL STEROID GLYCOSIDE FROM SEA CUCUMBER

Shimada, Shigetoshi (Shimada Pharmaceutical Institute, No. 4-123, Kohamanaka, Sumiyoshi-ku, Osaka, Japan)
Science 163, No. 3874, 1462 (March 28, 1969)

An antifungal steroid glycoside (named holotoxin) was isolated from the sea cucumber Stichopus japonicus (Selenka). In vitro, holotoxin has high activity against various fungi, including pathogenic fungi of vegetable origin, and has scarcely any activity against gram-positive and gram-negative bacteria and mycobacteria. [1 table, 4 references] [Abstracter: F. T. Piskur]

7.9 (Cross Reference: 0.112)

COLOR MEASUREMENT OF FOODS: X - TRISTIMULUS COLORIMETERS

Francis, F. J., and F. M. Clydesdale (Department of Food Science and Technology, University of Massachusetts, Amherst)
Food Product Development 3, No. 2, 66, 68, 72-73 (April 1969)

The authors review the various colorimeters available commercially that may be used in the color measurement of foods. The instruments considered are the Gardner, Photovolt, Color-Eye, Colormaster, Hunterlab, and others.
[14 figures, 5 references] [Abstracter: F. T. Piskur]

9.19 POLLUTION-CONTROL SURVEY SHOWS INDUSTRY'S EFFORTS

Anonymous
Chemical Engineering 76, No. 8, 64 (April 21, 1969)

The Manufacturing Chemists Association (MCA) has just completed a comprehensive sampling of chemical process firms in the United States and Canada. About 129 U.S. companies and 12 Canadian firms participated in the survey; about 9,300 chemical manufacturing processes were covered. The brief review here brings out some of MCA's findings on air- and water-pollution-control units, solid-waste disposal, operating expenses, and research outlays. Copies of the report may be obtained free from Chemical Engineering's Reader Service; the request number is 305.
[1 figure] [Abstracter: L. Baldwin]

6.54 STUDIES ON ADHESION OF FISH MEAT PRODUCTS ON CASING IN FISH SAUSAGE AND KAMABOKO--II. EFFECT OF DIFFERENT SPECIES OF FISH AND THEIR GRADE OF FRESHNESS ON THE RATE OF ADHESION

Yokoyama, Michio (Department of Industrial Technology, Kureha Chemical Co., Ltd., Tokyo, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 35, No. 2, 199-205 (February 1969) (In Japanese; figures, tables, and summary in English)

In 1966, the author investigated the degree of adhesion of fish sausage and fishcake products to the casings around them. To determine the degree of adhesion, he measured adhesion strength with a tensile adhesion tester, and he measured the weight of the meat attached to the casing. In the present investigation, he measures the rate of adhesion to the casing by boiled fish cakes (kamaboko) made of fish of nine different species and various grades of freshness.

The fat content of the fish meat was not related to adhesion, but the water content of the fresh fish was related to the weight of the meat attached to the casing. Myosin and myogen proteins of fish muscle were not related to adhesion strength or to the weight of the meat attached to the casing, but when the stroma protein of fresh fish meat was increased, the adhesion strength of the kamaboko made therefrom increased. Both adhesion strength and weight of the meat attached to the casing decreased as the freshness of the raw material deteriorated.
[4 figures, 2 tables, 14 references] [Abstracter: L. Baldwin]

7.8 (Cross Reference: 7.9)

ZUR FLEISCHARTBESTIMMUNG AUS FETTBESTANDTEILEN UND FETTBEGLEITSTOFFEN [DETERMINATION OF THE NATURE OF MEAT FROM THE FAT COMPONENTS AND SUBSTANCES ACCOMPANYING FATS]

Wurziger, J., and G. Hensel (Chemical and Food Research Institution, The Hygiene Institute of the Free and Hanseatic City of Hamburg, West Germany)
Fette-Seifen Anstrichmittel 71, No. 2, 145-151 (February 1969) (In German; English abstract)

The authors show that the polyunsaturated fatty acids (linoleic, linolenic, and arachidonic) and the cholesterol of meat fat can be used to assess the degree of adulteration of meats. [12 tables, 8 references] [Abstracter: L. Baldwin]

7.9 APPLICATIONS OF ELECTRON SPIN RESONANCE TO GAS-PHASE KINETICS

Westenberg, A. A. (Applied Physics Laboratory, Johns Hopkins University, 8621 Georgia Avenue, Silver Spring, Maryland)
Science 164, No. 3878, 381-388 (April 25, 1969)

The author discusses the use of electron spin resonance spectroscopy for the detection and measurement of a variety of free atoms and simple radicals. In certain applications, this technique coupled with carefully controlled fast-flow reactors allows the rates of elementary chemical reactions to be determined with unprecedented reliability. [5 figures, 3 tables, 38 references]
[Abstracter: F. T. Piskur]

9.13 BIOLOGICAL FORMATION OF FORMALDEHYDE AND DIMETHYLAMINE IN FISH AND SHELLFISH--
VIII. REQUIREMENT OF COFACTOR IN THE ENZYME SYSTEM

Yamada, Kinjiro, and Katsuhiko Harada (The Shimonoseki University of Fisheries, Yoshimi, Shimonoseki, Japan) and Keishi Amano (Tokai Regional Fisheries Research Laboratory, 5-5, Kachidoki, Chuoku, Tokyo, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 35, No. 2, 227-231 (February 1969)

In 1965, the authors showed that the formation of formaldehyde (FA) and dimethylamine (DMA) from trimethylamine oxide (TMAO) by the tissue homogenates of cod species was enhanced by addition of a small quantity of methylene blue. In this report, they show that a similar formation in the presence of methylene blue proceeds likewise in the reaction mixture containing crude enzyme solutions prepared by salting out. They confirmed the participation of a cofactor in the biological formation of FA and DMA from TMAO and established that the cofactor is heat tolerant and occurs not only in the tissue of cod species but in shark-liver tissue as well, although the tissue does not exhibit the enzyme activity. [3 figures, 1 table, 5 references] [Abstracter: L. Baldwin]

9.6 COMPARATIVE ENDOCRINOLOGY -- PERSPECTIVES IN ENDOCRINOLOGY
(Cross Ref.: 9.13)
Barrington, E. J. W., and C. Barker Jørgensen (eds.)
Hormones in the Lives of Lower Vertebrates, xvi+583 pp. (Academic Press, London and New York [December 1968]) Price 140s; $22.50
Reviewed by Ian Chester Jones
Nature 222, No. 5193, 601-602 (May 10, 1969)

In this book, treatment of the following subjects is pertinent to the fisheries: the modes of regulation of the movement of water and ions by biological tissues, the basic physicochemical laws at work with the action of hormones on the biological tissues of teleost fish and amphibians; the patterns of gonadal activity on the ovary and the testis; the relation of endocrine mechanisms to the natural life of the animal, principally the migration of salmonids and eels and the influence of hormones on normal breeding cycles; the various types of cells in the adenohypophysis of the major classes of amphibians and fish; and the central nervous control of adenohypophysial functions. The subject of this last chapter is being actively investigated in mammals, and the thorough review of the present status of hypothalamic-pituitary interrelations may illuminate some of the problems endocrinologists have been working on in mammals.
[Abstracter: L. Baldwin]

9.19 DDT: SUBLETHAL EFFECTS ON BROOK TROUT NERVOUS SYSTEM

Anderson, John M., and Margaret R. Peterson (Department of Biology, Carleton University, Ottawa, Canada)
Science 164, No. 3878, 440-441 (April 25, 1969)

Earlier work has demonstrated that fish show behavioral changes after exposure to sublethal amounts of pesticides. The chemicals may act on either the peripheral or the central nervous structures, or on both. One receptor system, the lateral line, of the fish is markedly affected by sublethal amounts of DDT. The central nervous system probably is the most likely site for the pesticide-sensitive region responsible for changes in complex behavior of the fish.

In the present experiments, brook trout were exposed for 24 hr. to sublethal doses of DDT. The cold-block temperature (change in low temperature sufficient to extinguish the propeller tail reflex of the fish) was altered in such a way as to suggest that DDT is affecting the thermal acclimation mechanism. Further, the sublethal dosages of DDT prevented the establishment of a visual conditioned avoidance response of the fish. [1 figure, 1 table, 10 references]
[Abstracter: F. T. Piskur]

9.6 STIMULATING COMMUNICATION -- ANIMAL COMMUNICATION
(Cross Ref.: 9.12)
Sebeok, Thomas A. (ed.)
Techniques of Study and Results of Research, xviii+686 pp. (Indiana University Press, Bloomington and London [February 1969]) Price $20; 186s
Reviewed by J. D. Carthy
Nature 222, No. 5191, 393-394 (April 26, 1969)

Among the 24 chapters in this book are chapters reviewing facts and theories about communication among fish (by Tavolga) and among marine mammals (by Poulter). Both have comprehensive bibliographies. [Abstracter: L. Baldwin]

9.17 INFLUENCE OF THE MUD ON THE CHEMISTRY OF WATER
(Cross Ref.: 9.19) IN RELATION TO PRODUCTIVITY

Golterman, H. L. (Hydrobiol. Inst., Nieuwersluis, Netherlands)
Chemical Abstracts 70, No. 10, 40554k (March 10, 1969)

9.6 PLANT, WASTE WATER CONTROL TECHNOLOGY
(Cross Ref.: 9.19)

Babcock, Russell H.
Instrumentation and Control in Water Supply and Waste Water Disposal, 90 pp. (n.d.)
(Available from Instrumentation and Control, c/o Book Department, Water and Waste Engineering, 466 Lexington Ave., New York, New York 10017) Price US$6.50
Food Processing 30, No. 5, 70 (May 1969)

The book deals with the fundamentals of and application of instrumentation and control in the field of municipal and industrial water supply and waste water disposal. [Abstracter: F. T. Piskur]

9.19 SLUDGE/BOD RATIO IS KEY TO WASTEWATER CLEANUP

Prescott, James H.
Chemical Engineering 76, No. 8, 60-62 (April 21, 1969)

Petro-Tex, a Houston, Texas, chemical firm, has been issued a patent (U.S. 3,401,113) for an aerated activated-sludge process that improves waste water containing water-soluble hydrocarbons. Segregated waste water goes to aeration lagoons where surface aerators mix it with activated sludge and oxygen. After about 3 days, the treated water passes to a clarifier, where the sludge is settled and the clear effluent is passed on to the ship channel. A slip stream of the effluent runs through a small pond, which the company has beautified by putting in goldfish and various types of water lilies.

According to company spokesmen, the biological treatment process removes 99 percent of the BOD (biochemical-oxygen-demand) and 90 percent of the COD (chemical-oxygen-demand). Only 250 lb./day of the BOD and 4,600 lb./day of the COD remain in the effluent. Government pollution-control authorities, the spokesmen add, are well pleased with the results.

Operation of the system is described and a breakdown of its costs given. [2 figures] [Abstracter: L. Baldwin]

9.17 PREDICTING DISSOLVED OXYGEN CONCENTRATION IN A LAKE COVERED WITH EVAPORATION SUPPRESSANT (Cross Ref.: 9.19)

Ahmad, M. T. (Environ. Eng. Dep., Bovay Eng., Inc., Houston, Texas)
Chemical Abstracts 70, No. 10, 40553j (March 10, 1969)

9.16 SYNTHETIC SEAWATER COMPOSITION

British Patent 1,128,503
Aquarium Systems, Inc.
Chemical Abstracts 70, No. 3, 17955h (February 3, 1969)

9.16 RECENT ADVANCES IN ARTIFICIAL CULTURE OF SALMON AND STEELHEAD TROUT OF THE COLUMBIA RIVER

Cleaver, Fred (U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Columbia Fisheries Program Office, Portland, Oregon 97208)
U.S. Fish and Wildlife Service Fishery Leaflet 623, 5 pp. (March 1969) (U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington, D.C. 20240)

The catch of salmon and steelhead trout from fish reared in [Columbia River Fishery Development] Program hatcheries increased rapidly beginning in 1964. By 1967 the benefits from operation of these hatcheries appeared to be well in excess of their costs. The Oregon moist pellet diet was the greatest single factor in providing an economically favorable operation.

Further advances in hatchery efficiency are expected in the next few years. Conservation agencies believe that the catch of hatchery-produced Columbia River fall chinook salmon, coho salmon, and steelhead trout can be increased substantially and that the cost per unit of production can be decreased. [4 figures, 1 table, 2 references] [Author's abstract]

9.6 (Cross References: 0.7, 6.19)
APPLIED ANIMAL NUTRITION. THE USE OF FEEDSTUFFS IN THE FORMULATION OF LIVESTOCK RATIONS

Crampton, E. W., and L. E. Harris
Applied Animal Nutrition. The Use of Feedstuffs in the Formulation of Livestock Rations, xxiv+753 pp. (Second edition, n.d.) (W. H. Freeman and Company, 660 Market Street, San Francisco, California 94104) Price $12.00
Reviewed by H. D. Branion
Poultry Science 48, No. 1, 360-361 (January 1969)

This textbook uses the new system of feed nomenclature developed by the Committee on Animal Nutrition of the U.S. National Research Council. It contains a table listing the nutritive ingredients of approximately 1,000 feeds. It contains the following sections and appendices:

Sections
1. What are Feedstuffs?
2. Nutritional Requirements of Animals.
3. The Nutritional Characteristics of Some Common Feeds.
4. Ration Formulation.
5. Nutrient Needs of Animals.

Appendices
1. Tables for metabolic size and numerical conversion.
2. The chemical and biological composition of feedstuffs.
3. Table of feed composition.

It appears to be a useful reference book for students, feed manufacturers, research workers, agronomists, range managers, wildlife managers, agricultural economists, and farmers. [Abstracter: F. T. Piskur]

9.7 (Cross References: 1.0146, 9.4)
SCIENCE, INDUSTRY AND GOVERNMENT

Flowers, B. H. (Science Research Council, High Holborn, London, W.C.1, England)
Nature 222, No. 5192, 421-425 (May 3, 1969)

The author compares the costs of research and development relative to the costs of applied technology in Britain and in other countries. He points out that Britain must look largely outside research and development for greater product reliability, better quality, and especially for increased productivity. Good management is the real basis of high productivity. He then traces the history of the British Government's involvement in science and industry, describing the plans for encouraging more scientists to enter industry and stating the policies affecting the level of present support of education and the future changes, within this level, of the type of education to be supported by the Science Research Council. Not only will continued help be given universities that train students for the Ph. D., but help will be offered to those universities that devise programs aimed at giving the student a capacity to grasp essential facts and ideas over a very wide area, to see in depth the interrelations between facts and ideas, and to plan the right action such an insight dictates. [3 references]
[Abstracter: L. Baldwin]

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